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LAN users find you still can't get there from here

Vendors slow to address NOS interoperability.

By Caryn Gillooly and Margie Wylie
Network World Staff

Interoperability may be on the lips of the leading network operating system vendors, but it doesn't appear to be in their hearts.

According to analysts and users, Banyan Systems, Inc., IBM, Microsoft Corp. and Novell, Inc. are simply not doing enough to ensure their products work with one another. While that may seem to be a basic need, there are only a handful of clumsy methods that let clients of one network operating system use the services of another.

Even with add-on products, the access that network operating system vendors offer is generally less than complete, never seamless and hardly better than it was 10 years ago.

NETWORK WORLD'S

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"Interoperability between these environments is less than expected or hoped for — and I'm being very gentle here," said Craig Burton, a principal analyst at The Burton Group in Salt Lake City.

Vendors have countered these criticisms with the introduction of complex interoperability architectures, illustrated with graphic renderings that more closely resemble the blueprints for Darth Vader's Death Star than what the average administrator recognizes as a local-area network.

While these plans may someday lay the basis for a lasting detente between the art and accounting departments' LANs, customers remain vexed by the need to integrate services at the core of today's network operating systems: file, print and directory services.

Harsh reality

Users need a common set of services across NOSes, but interoperability among LAN environments is limited today.

Service	Limitations
File	Limited access via gateways and multiple redirectors.
Print	Limited access through multiple redirectors or third-party products.
Directory	Proprietary directories limited to a single NOS.
Management	Proprietary tools limited to a single NOS.
Security	Proprietary schemes limited to a single NOS.
Messaging	Not available as a standard service.

NOS = Network operating system
GRAPHIC BY SUSAN J. CHAMPENY

This problem affects a broad array of users. According to a user study conducted by the Business Research Group, a consultancy based in Newton, Mass., a majority of LAN sites utilize multiple network operating systems.

And the need for interoperability will only intensify as more organizations extend their networks throughout the enterprise and share information among these former network islands.

Analysts agree that vendors

Windows opens wider to new data sources

Microsoft to work with Oracle, Sybase on links from Windows applications into database servers.

By Timothy O'Brien
West Coast Bureau Chief

REDMOND, Wash. — Microsoft Corp. is gaining strong allies for its Windows-based Open Database Connectivity (ODBC) interface with news last week of an expanded development effort with Sybase, Inc. and the expected announcement of an ODBC partnership with Oracle Corp.

In a briefing tomorrow at the Database World Conference & Exposition in Boston, Microsoft and Oracle will announce plans to jointly develop an ODBC driver that would provide connectivity from Windows applications to Oracle database servers.

Last week, Microsoft and Sybase said they would develop an ODBC driver to provide access from Windows to SQL Server on all Sybase-supported platforms, which include a range of Unix systems, Digital Equipment Corp. VAXes and Novell, Inc.'s NetWare. Microsoft markets SQL Server for OS/2.

Introduction of the ODBC connectivity tools will enable users

to build client/server applications with Windows front ends that can access some of the most widely used database servers.

INSIDE FEATURES

▶ Buyer's Guide detects flux in market for T-carrier muxes. Page 49.

▶ Test reveals the best memory-resident antivirus programs. Page 62.

NCR gateway will extend SNMP's reach

By Jim Duffy
Senior Editor

LINCROFT, N.J. — In an effort to expand the capabilities of standard management systems, NCR Corp. next month will unveil software that allows Simple Network Management Protocol-based consoles to manage non-SNMP devices.

The software, called Management Gateway, uses proxy agents to translate non-SNMP management protocols to SNMP, allowing SNMP management consoles to interact with any device as if it were outfitted with an SNMP agent.

The software obviates the need to configure every device with an SNMP agent, which can be costly. SNMP is also optimized for Transmission Control Protocol/

NETLINE
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BYTEX TO ROLL OUT routing modules for 7700 hub line, along with FDDI and net mgmt. products. Page 2.

EARLY AT&T InterSpan frame relay user cites savings, service quality. Page 2.

INTEROPERABILITY WOES will delay delivery of IBM's heralded new 6611 multiprotocol router. Page 6.

SUNSOFT'S SOLARIS 2.0 features powerful new networking enhancements. Page 6.

NEW WORK FLOW management software eases document routing across enterprises. Page 15.

GDC TO EQUIP its high-end Megamux TMS with a new routing module, may scrap frame relay device. Page 15.

NEWSPAPER

IBM dealt blow by ANSI's FDDI-over-copper decision

By Skip MacAskill
Staff Writer

MINNEAPOLIS — An ANSI subcommittee decision last week cleared the way for development of a single standard for FDDI over copper wiring.

Although several issues still must be addressed before a formal standard emerges, the approval of an encoding scheme removes the biggest obstacle to establishing a standard for supporting Fiber Distributed Data Interface networks over both shielded and unshielded twisted-pair wire.

The full standard is likely to be

approved in the next nine to 12 months, and users will probably see products based on it within the same time frame.

The vote was seen as a major victory for the Crescendo Communications, Inc.-Cabletron Systems, Inc. team that pushed the approved encoding scheme and a significant setback for an IBM-led group advocating an FDDI-over-shielded twisted pair-only solution — dubbed SDDI — based on a different encoding scheme.

The accepted scheme, MLT-3,

Bytex to roll out routing modules for its 7700 hub

Also announces plans to offer FDDI products and second release of its net management software.

By Maureen Molloy
Senior Writer

WESTBOROUGH, Mass. — Bytex Corp. last week disclosed plans to roll out by year end new internetworking modules that will give its Series 7700 Intelligent Switching Hub routing capabilities approaching those of a stand-alone router.

The company also said it will begin offering Fiber Distributed Data Interface products by this fall and unveiled the second release of its network management software, which will give the 7700 enhanced security and fault-prevention capabilities plus visibility to IBM's NetView management system.

Bytex formed technology alliances with Wellfleet Communications, Inc. and CrossComm Corp. to develop two separate eight-port bridge/router modules for the hub — one geared largely toward token-ring local-area networks and the other toward Ethernets. Each will enable a user to route data packets at wire speed among as many as four tokenring, two Ethernet and two wide-area network links.

That's a vast improvement over typical two-port router

LSI Logic lauds AT&T's public frame relay service

Says InterSpan ups performance, cuts costs.

By Bob Wallace
Senior Editor

MILPITAS, Calif. — LSI Logic Corp. last week said it has replaced its nationwide private-line network with AT&T's public frame relay service, a move that has cut costs and dramatically improved performance.

AT&T's InterSpan service is saving LSI Logic about $233,000 per month as compared to a full T-1 network, which was the only acceptable alternative. The service is also efficiently supporting a critical computer-aided design application that bogged down the company's old network.

"Everything with InterSpan has gone smoothly since we began cutting over sites to the service in January," said Dennis Anderson, LSI Logic's director of computing services. "It provides flexible, high-bandwidth [links] at an economical price."

Announced in November 1991, InterSpan is based on StrataCom, Inc. IPX 32 fast packet multiplexers in AT&T's nationwide network. The service is currently available from more than 100 points of presence.

Group mulls standard for OSI software distribution

By Michael Cooney
Senior Editor

BRUSSELS, Belgium — A European standards body is examining a proposed standard that would let any computer running Open Systems Interconnection FTAM software handle software distribution across a network.

The standard, dubbed Electronic Software Distribution (ESD) via FTAM, was proposed last week by mainframe software developer Proginet Corp. and is being considered by the European Workshop for Open Standards, based here.

Proginet, which specializes in OSI software, hopes to develop IBM mainframe software based on the standard.

The proposal is being applauded by users, groups such as the Corporation for Open Systems International (COS) and vendors including Novell, Inc. Analysts said that if ESD is implemented in File Transfer, Access and Management (FTAM) products, it could give the OSI world its first "killer" application.

"The ability to distribute software from a central location across multivendor platforms and networks is something no

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Briefs

The express lane. Systems Strategies, Inc. last week announced Express 3270 for Novell, Inc.'s NetWare for Systems Application Architecture software. Express 3270 enables IBM RISC System/6000 and Sun Microsystems, Inc. SPARCstations running NetWare SAA to emulate 3270 devices for access to IBM hosts. Available in July, it will cost between $1,000 and $3,000.

BT to make video splash. BT North America, Inc. is expected to announce this week four standards-based, turnkey videoconferencing systems and a multipoint control unit (MCU) that can tie eight locations into a videoconference. Introduction of the systems marks the first time BT has packaged its coder/decoder into offerings that also include a monitor, camera and cabinetry. The systems will adhere to the H.261 standard for multivendor conferencing. The MCU will work with BT codecs at speeds from 56K to 2M bit/sec and support other vendors' H.261-compliant codecs.

MCI delivers. MCI Communications Corp. will roll out its frame relay service on schedule this week. The carrier will not tariff the service, but instead will offer it initially on a contract basis. MCI declined to release any pricing information, but a spokeswoman said it will be offered on both a fixed-rate and usage-sensitive basis. MCI has been testing frame relay with a handful of beta customers.

Vendors form PPP consortium. A group of 10 network equipment and software vendors last week announced the formation of an interoperability testing consortium for products supporting the Point-to-Point Protocol, a standard for router-to-router communications. The group, spearheaded by Telebit Corp., also includes 3Com Corp., Cayman Systems, Inc., Cisco Systems, Inc., FTP Software, Inc., Livingston Enterprises, Inc., Morning Star Technologies, Network Applications Technology, Inc., Network Systems Corp. and Novell, Inc.

Dialing data links. AT&T last week announced the Definity High Speed Link (HSL), which enables its private branch exchanges to establish switched digital links. Users can dial up a single switched 56K or 64K bit/sec link through any AT&T Definity, System 75 and System 85 PBX. Definity Generic 3s can be programmed to dial the link at a preset time. Available now, HSL costs $2,200.

Building on Bedrock. Apple Computer, Inc. and Symantec Corp. will create programming tools that generate Microsoft Corp. Windows and Apple MacOS programs from one base set of code. Due in the first half of next year, Bedrock will be sold by both Symantec and Apple. Apple, which has felt the defection of programmers interested in the lucrative Windows market and uncertain of the Macintosh's future after the Apple/IBM alliance, hopes that the tools will persuade them to develop applications that essentially link the two environments.

Grab a five-pack. Novell, Inc. NetWare Version 3.11 users who only need to connect a few Apple Computer, Inc. Macintoshes will benefit from NetWare for Macintosh Version 3.011, which the company announced and shipped last week. The new release not only sells in a 5-user pack for $795, but also brings the printing features once reserved for its $2,995 200-user version to a $895 20-user and $1,995 100-user version. Version 3.011 lets network administrators keep printing statistics and charge for print jobs.

CONTACTS
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SunSoft boosts Solaris with new network capabilities

Also demos version of OS for Intel-based PCs.

By Margie Wylie
Senior Editor

NEW YORK — Taking aim at a market that lies somewhere between LANs and mainframes, SunSoft, Inc. last week shipped Solaris 2.0 for SPARC-based computers. The company also showed for the first time the 32-bit network-enabled operating system, running on Intel Corp.-based PCs, here at PC Expo.

The $795 Solaris 2.0 is one of several 32-bit operating systems vying for an emerging market of buyers who need the flexibility of personal computer local-area networks and the power of host systems. According to SunSoft, the operating system offers features like a network operating system but can be scaled to run on machines as powerful as hosts.

"PCs and workstations are colliding, and there's not a 32-bit operating system that isn't going to include at least rudimentary networking," said Jim Billmaier, vice-president of product marketing for SunSoft.

Solaris 2.0 offers users some of the services that will make up the company's Open Network Computing Plus, the foundation for its Federated Services Interface for interoperability.

The company's improved Network Information Services Plus (NIS+) naming system, Transport Independent Remote Procedure Calls and multithreaded, caching Network Filing Service

> The operating system can be scaled to run on machines as powerful as hosts.
>
> ▲▲▲

Plus will come with this release. NIS+ is SunSoft's rewritten hierarchical distributed naming service that now supports logical domains.

Billmaier differentiated SunSoft's approach with Solaris 2.0 from those of The Santa Cruz Operations, Inc., Unix System Laboratories, Inc. and Microsoft Corp., which will offer all but the most basic networking services

separately from their 32-bit operating systems. "We're not extracting the network components," he said.

Unlike its competitors, however, Solaris 2.0 won't ship with DOS, Microsoft Windows or Apple Computer, Inc. Macintosh emulators that let users run popular off-the-shelf applications under Solaris. Its sister company, SunSelect, is charged with developing those emulators separately, SunSoft officials said.

Solaris 2.0 also offers multithreading for the first time. "Multithreading allows you to write distributed applications that run with parallel processes, a capability we think single-processor users will want and need as much as multiprocessor [users]," said Stephen Bourne, director of systems architecture.

Parallel processing support lets developers create applications that execute more than one function simultaneously, rather than simply making a computer appear to do more than one thing at once by switching from one task to the next in rapid succession.

Solaris 2.0 puts multithreading to use in its own Tooltalk, a programmer's tool that lets applications send commands and data back and forth over a net.

The Intel-based version of Solaris will start shipping to OEMs interested in adapting it to run on their PCs in the third quarter. ⊡

Brixton intros APPN end node software for Unix

By Michael Cooney
Senior Editor

CAMBRIDGE, Mass. — Brixton Systems, Inc. last week become one the first companies to implement IBM Advanced Peer-to-Peer Networking (APPN) end node technology in its family of internetworking products.

The new BrxLU6.2/IP Router is software that runs on a Unix-based Sun Microsystems, Inc. SPARCstation. It supports distributed applications that can communicate between separate Transmission Control Protocol/ Internet Protocol nets using an existing Systems Network Architecture/APPN net as a transport, thus obviating the need for separate but parallel TCP/IP and SNA wide-area networks.

Another new product, the BrxLU6.2 Application Program Interface (API), aids in the development of LU 6.2-based applications, which can also communicate between Unix and IBM machines.

"The software can send TCP/IP data between islands of Unix systems over LU 6.2 without routing any data through the mainframe," said Herb Rush, president of Brixton.

Support for APPN end node technology means the BrxLU6.2/IP Router can send and receive APPN traffic, although it relies on adjacent APPN network

nodes to route data. End nodes can be configured as clients or servers in an APPN net.

The BrxLU6.2 API supports IBM's Common Programming Interface for Communications, an API that simplifies the process of writing applications that use LU 6.2 transport services.

For users in predominantly TCP/IP environments, Brixton also introduced three other SNA integration products.

BrxPassThru is a software gateway residing on a Sun SPARCstation that carries IBM 3270 traffic over TCP/IP nets to the IBM mainframe through Brixton's existing BrxPU2.1 Server. With embedded PU 5 communications support, the BrxPassThru software can also route 3270 traffic to Unix applications on the TCP/IP net.

Brixton also announced BrxTelnet 3270 and Brx3270B. BrxTelnet3270 lets a Sun SPARCstation running DOS, SunView, Windows or X Window System emulate a 3270 device. Brx3270B provides 3270 emulation for a variety of Unix platforms.

The BrxLU6.2 API is available now for $3,950. The BrxLU6.2/ IP router will be available Aug. 1 for $4,950. The BrxPassThru, BrxTelnet3270 Server and Brx3270B are available now and cost $2,450, $950 and $1,950, respectively. ⊡

Interoperability concerns delay IBM router delivery

By Michael Cooney
Senior Editor

WHITE PLAINS, N.Y. — Users waiting for IBM's much bally-hooed 6611 router will have to wait a little longer.

IBM announced last week it is delaying general availability of its 6611 Network Processor from June 26 to Sept. 25. Advanced features, such as support for routing Apple Computer, Inc. AppleTalk and Network Basic I/O System packets between Ethernet local-area networks, will ship in January 1993 instead of this September, the company said.

IBM blamed the delays on problems that cropped up during interoperability testing.

"There is no single thing wrong with the 6611, but there are a number of bugs that need to be ironed out before we release it," said John Fjeld, product manager for network routing systems in IBM's Networking Systems group. "When we took a half-dozen serial interfaces and protocols that are supposed to work in any permutation, we had some unex-

pected results."

Fjeld cited Internet Protocol routing over a frame relay net from a Token-Ring LAN as an example of a difficult routing permutation, though he declined to say if that was one of the areas in which the 6611 was having trouble. "We now want to take the time to satisfy ourselves that all combinations are working together smoothly," he said.

There have also been delays in interoperability testing between the 6611 and Network Equipment Technologies, Inc.'s (NET) LAN/WAN Exchange (LWX). In January, NET said the 6611 would interoperate with the LWX and it would license the 6611's Data Link Switching technology for future use in the LWX.

"The next release of our LWX will interoperate with the 6611, and we don't expect these delays to change that," said Selina Lo, LWX product-line manager at NET. Lo would not specify which interoperability tests were causing problems.

Lo said IBM has to deal with

new hardware and software plus learn how to integrate the 6611 with many protocols with which it is not completely familiar, such as AppleTalk and Digital Equipment Corp.'s DECnet.

"Testing router interoperability is a complex job IBM hasn't dealt with before," Lo said.

Meanwhile, industry watchers had mixed reactions to the router delays.

"It's a tremendous blow for IBM's internetworking plans," said Anura Guruge, lead consultant at BBN Communications Corp. in Cambridge, Mass. "If IBM is having trouble bringing out 'me too' products, then they really have problems. The delay *(continued on page 73)*

Correction: The story "Nynex R&D division trials Fujitsu switching system" (*NW*, June 22) incorrectly stated that Fujitsu America, Inc. will be the likely provider of Asynchronous Transfer Mode switches to support Nynex Corp.'s broadband services. Nynex will be taking requests for proposal for the switching platform, and all bids will be given equal consideration.

Adaptive preps for release of ATM switching system

ATM/X supports connections for 16 devices.

By Jim Duffy
Senior Editor

NEW YORK — Adaptive Corp. next week will unveil an Asynchronous Transfer Mode (ATM) switch it will position as a higher performance alternative to Fiber Distributed Data Interface LANs.

According to sources who requested anonymity, the ATM/X will connect as many as 16 devices in a local ATM network. Some of the ports can be used to link bridge/routers to the switch, enabling remote LANs to access applications on the ATM net.

Adaptive and its parent company, Network Equipment Technologies, Inc., will unwrap ATM/X at investment firm Bear Stearns & Company, Inc. here. Bear Stearns is an Adaptive client and a beta user of the ATM/X.

Sources said Sun Microsystems, Inc. and Retix have already

developed interfaces to the ATM switch for their respective workstations and routers, and will participate in next week's announcement.

Adaptive is discussing development of interfaces with other vendors.

Adaptive and other companies declined comment.

The switch reportedly will be positioned as an alternative to FDDI for applications needing greater bandwidth. It has a backplane speed of 1G bit/sec and will cost about $4,500 per port, which is comparable to current FDDI concentrators.

"This is in the same ballpark as FDDI, but it's offering users big advantages," said Rick Malone, principal of the Vertical Systems Group in Dedham, Mass. "There's a very good likelihood *(continued on page 72)*

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COMPAQ

Work flow software aids in complex document routing

Logical Software Solutions introduces FlowMan.

By Wayne Eckerson
Senior Editor

GREENBELT, Md. — Logical Software Solutions Corp. last week took the wraps off a robust work flow management system that automates the routing and management of documents containing text, voice, video and images across departments or enterprise networks.

FlowMan is personal computer software that lets administrators or project leaders with little or no programming skills define work flows for project or office work groups using a menu-driven system. With FlowMan, administrators can create electronic documents and decide how they will be routed within a group as well as what actions need to be taken each step of the way.

The software can be integrated with a variety of imaging and document management systems to support high-volume document processing activities, such as claims or check processing.

FlowMan runs under Microsoft Corp. Windows and works with most relational databases, including Oracle Corp.'s Oracle Server, Sybase, Inc.'s SQL Server, Gupta Technologies, Inc.'s SQL-Base and IBM's DB2.

The software's core component is a Dynamic Data Exchange (DDE) engine that lets users integrate FlowMan with any Windows application. DDE also lets analysts gather statistics from FlowMan and paste them into spread-

> ## "Most of the RFPs for image management systems today require work flow capabilities."
>
> ▲▲▲

sheets or word processing programs to produce custom reports on work flow processes.

FlowMan provides export capabilities for Excel spreadsheets, dBase and ASCII text.

Logical Software Solutions, based here, is initially marketing FlowMan to users of document and imaging management systems who want to get more from their systems.

"Most of the RFPs for document and image management systems today require work flow capabilities," said Mary Collier, president of Logical Software Solutions. She added that many work flow products today are tied to a specific document or image management system. FlowMan, on the other hand, is designed to work with any document or image system and any ANSI-compliant SQL-based relational database management system.

FlowMan supports parallel routing, which allows a single document to be sent simultaneously to multiple users. It also allows users to override the work flow and send documents forward or backward in the routing path or reroute documents to other users. FlowMan supports a queue management facility that identifies available users and distributes queued documents to them.

FlowMan provides audit trails, audit reporting and supervisory monitoring to help administrators evaluate the efficiency of work flows and make changes to optimize work processes.

The software also allows net managers to perform ad hoc queries against audit information by pointing and clicking on menus.

Available now, FlowMan costs $2,995 for the administrator module and $325 for the client module. ▣

Verimation E-mail system boasts work flow features

By Wayne Eckerson
Senior Editor

BOSTON — Verimation, Inc. will announce at the Database World Exposition here this week a local-area network-based electronic mail system with integrated work flow, calendaring and directory services, as well as a new version of its IBM host-based E-mail system.

Memo LAN runs on Microsoft Corp. Windows personal computer clients and IBM LAN Server, Novell, Inc. NetWare and Microsoft LAN Manager servers. The offering is integrated with Verimation's Memo, a host-based E-mail system, so users of both systems can exchange messages using IBM's LU 6.2 protocols. The two systems also share the same addressing scheme and have synchronizable directories.

Memo has 1.3 million users in 850 sites worldwide. Initially developed by AB Volvo for internal use, it has been marketed externally since 1984.

Memo LAN incorporates basic work flow and calendaring tech-

nologies from Action Technologies, Inc. Work flow features enable users to send structured requests or memos to designated individuals via E-mail. The recipients respond by choosing from a set of responses. For example, a Memo LAN user can initiate a dialogue that asks another user to respond to a memo. The recipient can decline, accept or make a counteroffer to the request.

Verimation will also introduce Memo Version 4, which separates Memo services, such as messaging, bulletin board, archives and calendars, so they can function independently on the host.

This allows IBM 3270 users to access multiple Memo services at the same time, much like Windows clients can bring up multiple programs on their screens.

Eventually, Verimation will allow Memo services to run on separate platforms, giving users greater flexibility to deploy services on local or remote servers. For example, a user might want to run Memo's messaging component on a departmental server in

order to improve performance but may want to run calendaring on a host to coordinate schedules across the company.

In addition, Verimation is announcing 3270 emulation software for OS/2 Presentation Manager, Apple Computer, Inc. Macintosh and Windows PCs.

Memo LAN will be available in September. The client software

> ## Memo LAN is integrated with Verimation's Memo, allowing users of both systems to exchange messages using LU 6.2.
>
> ▲▲▲

ranges in price from $20 to $100 per user, depending on amount purchased. The Memo LAN server software costs $500. Memo Version 4 will cost $42,000 and up, depending on options, and will be available in September. The terminal-emulation software ranges in price from $20 to $100. ▣

US West outlines frame relay, SMDS deployment

By Bob Wallace
Senior Editor

ENGLEWOOD, Colo. — US West Communications, Inc. last week laid plans to deploy frame relay and Switched Multimegabit Data Service (SMDS) by year end.

The carrier will offer intra-local access and transport area frame relay in 14 metropolitan areas beginning this month — the widest deployment yet by a local carrier.

The company will offer frame relay access speeds of 56K and 1.5M bit/sec and permanent virtual circuits (PVC) ranging in speed from 9.6K to 768K bit/sec. Users will pay a flat per-port fee.

Service will be offered in Denver, Minneapolis and Omaha, Neb., by the end of next month, and in Albuquerque, N.M.; Olympia, Portland and Salem, Ore.; Phoenix; and Seattle by the end of October. The carrier will then deploy service in Boise, Idaho, Colorado Springs, Des Moines, Iowa, Salt Lake City and Spokane, Wash. US West Communications has already set pricing for frame relay in Nebraska.

The service carries a one-time per-access port installation charge of $400 for each 56K bit/sec port and $600 for a 1.5M bit/sec access port. The carrier also assesses users a onetime $15.50 installation charge per PVC.

Monthly recurring charges range from $104.90 for one 56K bit/sec PVC to $256.10 for five PVCs. The user pays $13.20 for each additional PVC. Charges range from $347 for one 1.5M bit/sec PVC to $695 for five. Each additional PVC costs $31. The carrier will offer SMDS in Minneapolis and Denver in August, and in Seattle in early 1993. ▣

GDC to add LAN routing module to high-end mux

Weighs plan to scrap frame relay access device.

By Jim Duffy
Senior Editor

MIDDLEBURY, Conn. — General DataComm, Inc. (GDC) early next year plans to add LAN routing capabilities, reportedly developed by CrossComm Corp., to its high-end multiplexer.

At the same time, GDC is considering pulling off the market a frame relay access device for IBM Systems Network Architecture traffic. That device, the FR 2000, has been on the market for a little over a year, but GDC has sold only a handful, said Tim Smith, GDC director of product management.

According to Smith, in the first quarter of 1993, GDC will release a routing module for its Megamux Transport Management System (TMS) that will include frame relay interfaces. GDC declined to disclose the developer of the routing module, but observers believe it is CrossComm, a vendor with which GDC has had an OEM relationship for over two years.

CrossComm, which recently went public, did not return phone calls by press time.

Smith declined to provide details on the routing module. But observers believe it will be a modularized version of CrossComm's ILAN router, supporting four interfaces to frame relay access devices or Ethernet and token-ring local-area networks.

The module will forward 40,000 packet/sec and support Novell, Inc.'s Internetwork Packet Exchange (IPX), the Transmission Control Protocol/Internet Protocol, Apple Computer, Inc.'s AppleTalk protocol and the Shortest Path First routing protocol.

The module will also support CrossComm's proprietary Protocol Independent Routing (PIR) software, sources said. PIR provides routing for SNA and Network Basic I/O System protocols without encapsulation.

The fate of the FR 2000, meanwhile, is still being determined by GDC officials, Smith said, even though the company no longer manufactures it. And though GDC has not yet decided to pull FR 2000 from the shelves, "the market for that class of product has not developed that strongly," he acknowledged.

The FR 2000 provides a 56K bit/sec frame relay interface to Megamux TMS backbones for IBM Synchronous Data Link Control and Binary Synchronous Communications devices. The FR 2000 will be superseded by the Office Communications Manager (OCM), a low-end multiplexer that links to a Megamux TMS backbone over two T-1 or E-1 wide-area links.

The OCM will go into beta-test sites in July or August, Smith said. ▣
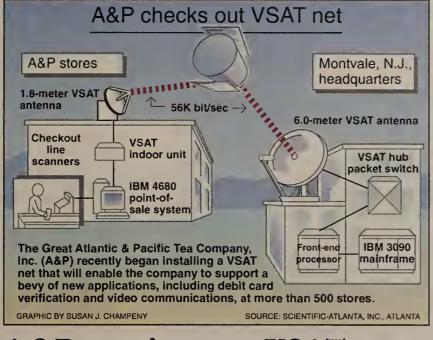
Data Packets

In the midst of its June 16 client/server product rollout, **IBM** also announced enhancements to its Enterprise System Connectivity (ESCON) channel architecture and network automation platforms.

A new ESCON Multiple Image Facility (MIF) will let a single ESCON channel serve multiple partitions of the mainframe. Previously, a separate ESCON channel was required for each partition of the mainframe. MIF is contained in MVS/ESA SP Version 4 Release 3, which is due out in March 1993.

In addition, **Ameritech** announced a service whereby users in the Midwest can link their ESCON-based hosts to the carrier's fiber-optic network and connect to remote local-area networks, other mainframes, storage systems or high-speed printers.

Ameritech, the parent company of Bell operating companies in Illinois, Indiana, Michigan, Ohio and Wisconsin, will begin offering its Host Interconnection Service for ESCON users in the first quarter of 1993. ⚡

A&P checks out VSAT net

A&P stores — 1.8-meter VSAT antenna — 56K bit/sec → — Montvale, N.J., headquarters — 6.0-meter VSAT antenna

Checkout line scanners — VSAT indoor unit — IBM 4680 point-of-sale system — VSAT hub packet switch — Front-end processor — IBM 3090 mainframe

The Great Atlantic & Pacific Tea Company, Inc. (A&P) recently began installing a VSAT net that will enable the company to support a bevy of new applications, including debit card verification and video communications, at more than 500 stores.

GRAPHIC BY SUSAN J. CHAMPENY   SOURCE: SCIENTIFIC-ATLANTA, INC., ATLANTA

A&P setting up VSAT net to register service gains

Other major grocery chains expected to follow.

By Bob Brown
Senior Editor

MONTVALE, N.J. — While large retailers were quick to adopt very small aperture terminal technology to address the networking needs of their geographically dispersed stores, supermarkets have been slow to follow suit.

However, the Great Atlantic & Pacific Tea Co, Inc. (A&P) has begun installing a VSAT net to replace its terrestrial links, a move analysts said could prompt other major players to adopt the technology. While A&P is scheduled to become the first major national chain to deploy a private satellite network, VSAT vendors report other supermarket chains are hot on A&P's heels.

Supermarkets such as A&P are looking to VSAT nets to address their growing data communications needs. Data traffic is increasing as a growing number of chains embrace new customer services, such as credit and debit cards. Supermarkets are also collecting more point-of-sale data on the merchandise they sell and need to process it faster to support electronic data interchange applications.

"Almost all the companies in the grocery industry are experimenting with credit cards," said Shelly Revin, senior vice-president of marketing and sales at Hughes Network Systems, Inc. in Germantown, Md. "This sort of application requires much faster response times than the supermarkets are used to, and VSAT networks are the platform many

companies are looking at as a solution."

Credit card firms are enticing supermarkets to accept their cards by lowering the rates, said Revin, whose company recently formed an alliance with a Florida firm that has designed a turnkey data collection system for supermarkets.

A&P, which thinks credit card rates are still too high, is rolling out support for debit cards first, said Peter Rolandelli, vice-president of information and administrative services at A&P, an $11.6 billion company. Debit cards work like checks; they let users authorize withdrawal of funds from bank accounts to pay for purchases.

A&P is looking for a more cost-effective way to handle debit card transactions than the 4.8K bit/sec dial-up terrestrial links the VSAT net will replace.

"We need to deliver good service to the customer to stay competitive, and much of that revolves around the payment area," said Rolandelli, who acknowledged that supermarkets are generally four to five years behind general retailers in supporting electronic payments. "Customers increasingly are finding [debit] cards to be convenient."

A&P also plans to use the VSAT net to better monitor in-store inventory, he said.

"The amount of information supermarkets are accumulating about transactions is increasing immensely," Rolandelli said.

New NCR packs offer centralized control

Software distribution and remote client manager wares work with Unix, OS/2 and DOS machines.

By Jim Duffy
Senior Editor

DAYTON, Ohio — NCR Corp. last week brought out two software packs that allow users to automatically distribute software to computers located throughout an enterprisewide network and centrally manage remote desktop clients.

Software Manager enables administrators to electronically distribute, install and track software on remote Unix, OS/2 and DOS computers from a central site. Client Manager lets users monitor and control the operation of OS/2 and DOS computers on local and remote LANs from a central management station.

Both applications include agent software that runs on managed systems and programs that run under NCR's StarSentry Systems Manager. StarSentry Sys-

tems Manager runs on an Intel Corp. i386 and i486-based platform under Unix System V, Release 4 and supports the Simple Network Management Protocol and Common Management Information Protocol over Transmission Control Protocol/Internet Protocol. It provides centralized management of enterprisewide computing resources from multiple vendors, including servers, hubs and concentrators, network software, bridges and routers.

Software Manager distributes software over TCP/IP, Open Systems Interconnection and IBM Systems Network Architecture networks. Each work group in the net is assigned a profile, which correlates to the software each personal computer in the work group should be running. When any PC's software does not corre-

NDM pack gains SQL extension

By Wayne Eckerson
Senior Editor

RESTON, Va. — Systems Center, Inc. has introduced an SQL extension to its host-based file-transfer software that enables users on a variety of computer platforms to access data on IBM DB2 databases.

Network Data Mover (NDM)-MVS/SQL enables users to transfer data from DB2 databases to other computers across IBM Systems Network Architecture nets. It also lets users transfer between DB2 databases on the same net.

NDM-MVS/SQL supports data transfers between DB2 databases and applications running under IBM's MVS, VM and VSE operating systems, Digital Equipment Corp.'s VMS, and Tandem Computers, Inc.'s Guardian, OS/2 and DOS. A company official said Systems Center will migrate NDM-MVS to other platforms as customer demand dictates.

Previously, NDM-MVS only transferred data between standard file systems, not databases. NDM-MVS supports the automatic transfer of files between MVS hosts and other machines running NDM-MVS software, including personal computers, OS/2 servers, Application System/400 minicomputers and other hosts.

The strength of NDM-MVS is that once it finishes transferring data, it can automatically trigger jobs that make use of the data.

For example, a bank branch office can use NDM to upload daily account information to a host computer at headquarters. Once the file transfer is complete, NDM-MVS can kick off an application that processes the information and returns updated account data to the branch office later that evening.

NDM-MVS is used heavily in banking and financial services, according to Jay Morris, product marketing manager for file-transfer products at Systems Center in Dallas.

NDM-MVS/SQL is now available on a limited basis, with a general release scheduled for the third quarter. Prices range from $4,400 to $21,850, depending on the processors supported. ⚡

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Netnotes

At PC Expo last week, **NET-inc** brought out a local-area network management product designed to let administrators of Novell, Inc. NetWare LANs more easily use the utilities included with NetWare.

Administrators using the NetMenu LAN Management Toolkit Version 4.20 can, for example, customize and modify the security attributes of NetWare utilities such as Netcon and Syscon in accordance with individual company policies and needs.

NetMenu 4.20 is currently available and is priced at $395.

Raycom Systems, Inc. has brought out two new versions of its fiber-optic extenders for token-ring networks. Designed to overcome the standard limitation of 100 meters between multistation access units, the extenders work with any standard IEEE 802.5 token-ring network to allow users to locate hubs anywhere from 1 to 30 km apart.

Joining the company's current Model 3410, which offers distances up to 4 km, are the Model 3410X, a $3,830 unit supporting distances up to 30 km; and the 3410S, a $895 lower end model for distances up to 1 km.

Both versions are available either as cards that mount in an eight-slot rack or in stand-alone cases.

Crescendo, SGI announce jointly developed adapter

Pair produce FDDI-over-copper board for SGI PCs.

By Bob Brown
Senior Editor

Crescendo Communications, Inc. and Silicon Graphics, Inc. (SGI) last week announced they have codeveloped an adapter for SGI's IRIS Indigo RISC-based personal computers that supports FDDI over copper wire.

In addition, SGI has thrown its support behind Crescendo's technology proposal for a Fiber Distributed Data Interface-over-copper standard and agreed to resell Crescendo's wiring hubs.

Crescendo is a Sunnyvale, Calif., vendor of FDDI and FDDI-over-copper hubs and adapters, and SGI is a Mountain View, Calif., maker of PCs and workstations, largely for the scientific marketplace.

Crescendo and SGI have been working for six months on an FDDI-over-copper daughterboard for SGI's IRIS Indigo Reduced Instruction Set Computing-based PC.

The daughterboard, which resides on a new FDDI motherboard, enables SGI's IRIS Indigo PCs to be linked directly to a Crescendo 1000 Workgroup Concentrator, said Robert Clark, director of distributed computing at SGI. The boards are designed for SGI's proprietary Graphics I/O bus, which is optimized to handle high-performance graphics applications, he said.

Users can obtain up to 70M bit/sec of data throughput to the desktop using the FDDI-over-copper setup and similar performance over fiber, Clark said.

SGI's IRIS Indigo PCs could previously connect only to Ethernet LANs, he said.

Clark estimated that between 10% and 15% of SGI's installed base of IRIS Indigo users could be using FDDI over fiber and copper within a year of product availability. FDDI over copper could really catch on, he said.

"The desktop computers are networked by [unshielded twisted pair] typically, and [users] want to take advantage of the installed wiring," he said. "We think that [FDDI over unshielded twisted pair] is probably a much better solution for as much as half of our customer base."

The FDDI motherboard for the SGI IRIS Indigo will start shipping in July. It will cost $3,500 for a single attachment and $4,700 for a dual attachment.

SGI has not announced availability or pricing for the FDDI-over-copper daughterboard because it is waiting to evaluate the standards situation, which was expected to be clarified last week at an ANSI meeting.

New archival systems for NetWare bow

By Caryn Gillooly
Senior Editor

NEW YORK — Maynard Electronics last week brought out new versions of its ArchiveXL and ArchiveVP network archiving systems that offer increased support for Novell, Inc.'s NetWare.

Announced at PC Expo here, the new versions also include enhancements that will make it easier to find files that have been backed up and provide an easier migration path to Maynard's higher level MaynStream archival system.

Maynard's ArchiveXL is the company's entry-level archiving system and uses minicartridges, while its ArchiveVP product offers more advanced features and uses full-size tapes.

The company also announced that its higher level MaynStream product has been determined to be compatible as a backup system in Lotus Development Corp.'s Notes environments.

The new version of ArchiveVP is based on a new release, Version 4.0, of the system's QICstream software, which has four primary new features, according to Candice Gray, product marketing manager for Maynard, based in Lake Mary, Fla.

Perhaps most important, Gray said, QICstream 4.0 now supports all existing versions of NetWare: NetWare 2.X, 3.X and Lite. Previously, the product could only back up NetWare 2.X LANs.

(continued on page 20)

The 4 faces of NetWare

NetWare Lite
- DOS-based peer-to-peer file and print services. Does not interoperate with other versions of NetWare that offer more advanced services.

NetWare 2.X
- First of three products based on Novell's own operating system kernel. Offers proprietary management, support for Message Handling Services (MHS), password encryption and flat-file directory. Can be extended through value-added processes.

NetWare 3.X
- Runs on new, more Unix-like version of the Novell kernel. Offers hierarchical NetWare Naming Service, support for several switchable E-mail engines, password encryption and is managed by Novell's NetWare Management System. Developers write applications that use these services through NetWare Loadable Modules (NLM).

NetWare 4.X
- Due by year's end, will offer all advanced services, including distributed naming service; management from other consoles through NetWare Global Management; advanced security services such as on-line encryption and digital signatures; and support for many different E-mail engines. Version 4.X is also extended through NLMs.

GRAPHIC BY SUSAN J. CHAMPENY

New NetWare sparks confusion for users

Analysts cite user concerns about multiplicity of versions and status of earlier product releases.

By Margie Wylie
Senior Editor

PROVO, Utah — To many users, Novell, Inc.'s NetWare Version 4.0 sounds like a dream, but adding another major version of NetWare to the network may turn out to be more of a nightmare.

NetWare 4.0, Novell's upcoming top-of-the-line release, will put the majority of NetWare users two steps away from the enterprise local-area network solution and integration services the company has been promising for years. And while the different versions of NetWare will interoperate, network administrators and end users may find themselves working with four distinctly different NetWare environments on a single network.

Sporting sophisticated security, open management and a distributed directory service, NetWare 4.0 will bring the number of iterations of NetWare on the market to four — NetWare Lite, 2.X, 3.X and 4.X — when the product ships later this year.

Novell officials claim the company's increasingly variegated product line offers users alternatives, but analysts said Novell has overlooked the long-term interests of its users.

"Every user I know is madder than hell," said Jamie Lewis, vice-president of Information Services for The Burton Group, a Salt Lake City-based industry research and consulting firm. "Novell sold them Version 2.X as a work group solution and said they could upgrade to 3.X when they wanted something for the enterprise. Now [Novell] comes along and says, 'We were just kidding.'"

Instead, the premier operating system that Novell promised with 3.X has been separated from users by yet another upgrade. Fewer than 20% of Novell's current installed base have even made the leap to NetWare 3.X, which has been out for three years now, Lewis said. He expects the transition to 4.X will be even slower and more painful.

"If Novell sells 4.0 for 20% to 25% more [than 3.X], you're looking at about $17,000 for 250 users. If you are a 2.X user, you are talking a very steep, very expensive migration," Lewis said. "Novell will be lucky if 20% of users are on 4.0 by 1996."

Meanwhile, Novell continues to sell 2.X at nearly twice the price of 3.X, according to a Burton Group estimate. Novell sees nothing wrong with that.

"It is our expectation that [2.0] customers don't want all the *(continued on page 20)*

New NetWare sparks confusion for users

functionality [of 4.0]. We're doing our customers a real service here; this gives them more options," said Bob Young, director of marketing for Novell's NetWare products division.

Users who have to cobble together networks from four different types of NetWare, however, may not see it that way. Although they will interoperate, the various versions offer different levels of service.

"Multiple versions of NetWare Lite, 2.X, 3.X and now 4.X will be a bear to administer," said Matt Cain, senior research analyst at the META Group of Westport, Conn.

NetWare Lite, 2.X, 3.X and 4.X all use different directories, which will give different users different views of the network. For example, a user attached to a Version 4.0 server will be able to take advantage of its X.500-like distributed directory service to find and attach to network services on other 4.0 servers.

However, when accessing non-4.0 servers, users will have to resort to entirely different conventions under either the NetWare Naming Service, a hierarchical naming service offered as an option to 3.X, or the original flat-file NetWare bindery, which comes as a standard part of NetWare 2.X and 3.X.

NetWare Lite currently does not interoperate with the other versions of NetWare, although Novell officials said it will in future. In addition, NetWare Lite, 2.X and 3.X users will not have access to the high-level network services, such as the distributed directory, on which Novell is

New systems for NetWare debut

Support for NetWare 3.X is important, Gray said. "Even in smaller networks, more and more people are starting out with NetWare 386."

Also included with the new software version is a cataloging feature, which enables the system to create a database of all tapes in the backup library and all the files on each tape. When a user needs a file, ArchiveVP finds it by searching the database, rather than forcing the user to manually search through tapes.

QICstream 4.0 also now uses the Maynard Tape Format, so tapes can be read by MaynStream software for customers migrating to the higher end product. Additionally, the new version includes a new user interface that's compatible with IBM's Systems Application Architecture user interface standard.

Enhancements with the new ArchiveXL 9250 minicartridge system include support for a 1M bit/sec floppy controller, which virtually doubles the data transfer rate of the previous version, which used 500K bit/sec controllers.

Moreover, the new software for ArchiveXL — QICstream 3.0XL — now supports NetWare 3.X LANs, whereas the previous version only supported NetWare 2.X environments.

Both ArchiveVP and ArchiveXL are available now," with prices starting at $995 and $499, respectively. ⚡

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basing its strategy for integrating NetWare with other network operating systems.

"Directory services will help people manage the network if it's one server or 1,000," said Lewis, adding that Novell should certainly stratify its product line, but for the good of users and itself, it should base all those versions on its latest technology and upgrade users as quickly as possible.

"Create a scaled-down version of 4.X, maybe without a NetView agent or protected mode, but don't try to sell me 2.X or 3.X," said Lewis.
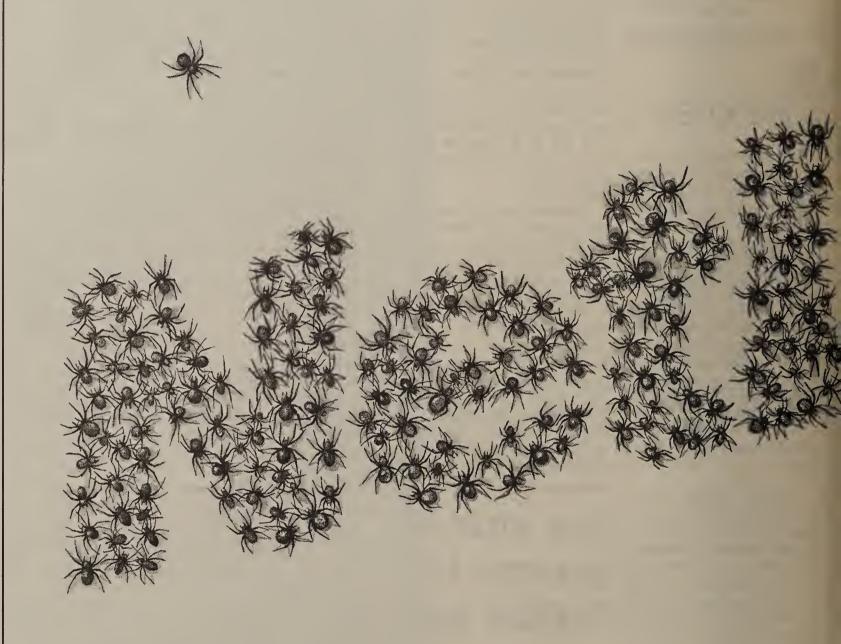
Novell's failure to offer advanced services to its huge installed base of 2.X and 3.X users may be to the benefit of rivals. Some, such as Banyan Systems, Inc., are already eyeing the prospect of selling these users advanced services.

But even as Novell defends its choice to sell the 2.X line, it admits the product has a limited life. "With the 2.X line, we'll keep selling it as long as people keep buying it. We'll enhance that product as far as service pieces, but the platform for future significant [enhancements] is the [NetWare Loadable Module platform of NetWare 3.X

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and 4.X]," said Young. In what appears to be an attempt to steer its largest users to Version 4.0, Novell has also backed off its promise to offer a 1,000-user version of 3.X, he added.

But the company still has not made it easier or less expensive for the bulk of its customers to upgrade from NetWare 2.X to the architecturally similar 3.X or 4.X. "Novell needs to balance its needs to have a great bottom line at the end of the quarter against its long-term goals of building a strong user base and satisfying customers," said Lewis. ⚡

New NCR packs offer centralized control

spond to the profile, the Software Manager agents trigger an alarm to the Systems Manager console to distribute the appropriate release.

Software Manager can access remote local-area networks through gateways that reside on NCR StarGroup LAN Manager servers on each LAN. These servers, in turn, receive commands from the Systems Manager to distribute the software to the LAN clients.

Software Manager's requirement for StarGroup LAN Manager may be an obstacle for NCR in cracking accounts where Novell, Inc.'s NetWare is already installed, said Doug Gold, an analyst at International Data Corp. in Framingham, Mass. Novell's share of the LAN operating system market is about 60%, according to various estimates by industry analysts.

Moreover, the lack of Apple Computer, Inc. Macintosh support is a hole in NCR's management strategy, Gold said.

"That may be a problem for mixed Macintosh and DOS environments," he said.

Monitoring aid

Client Manager allows network administrators to monitor memory consumption and system performance. It also allows them to execute commands to remote machines to transfer files, for example, or to reboot the system.

Users can define what should be monitored and which conditions should trigger alarms. If a problem arises — such as a disk error or insufficient system memory — the Client Manager agent triggers an alarm on the Systems Manager interface.

Client Manager also automatically registers new clients when they are added to the network, creating an icon on the Systems Manager screen.

Pricing for a Software Manager configuration including a management station and management gateways for 50 LANs is approximately $320,000. Client Manager, including a management station and gateways for 50 LANs, costs approximately $164,000. Both products are available now.

Gold said NCR's pricing strategy is expensive and unrealistic.

"I doubt many people have those kind of big system requirements," he said, referring to the 50-LAN packaging. "They must be looking at the Fortune 50." ⊿

A&P setting up VSAT net to register gains

A&P's VSAT net will deliver data to its data processing center more often than was economically feasible using pay-as-you-go dial-up lines, he said.

Updating the company's databases more frequently will speed response to customer buying patterns and help the retailer keep its shelves stocked with the most popular products.

A&P's multimillion-dollar private satellite net from Scientific-Atlanta, Inc. will feature a master hub earth station at the chain's headquarters site here. It will provide links to the company's Columbia, Md., data processing center and more than 500 stores, initially those in A&P's Super Fresh chain (see graphic, page 17). Down the road, the net will serve other A&P regional chains, including Farmer Jack, Food Emporium, Kohl's and Waldbaums.

The VSAT net will support audio, data and video communications via 56K bit/sec links to and from the earth station.
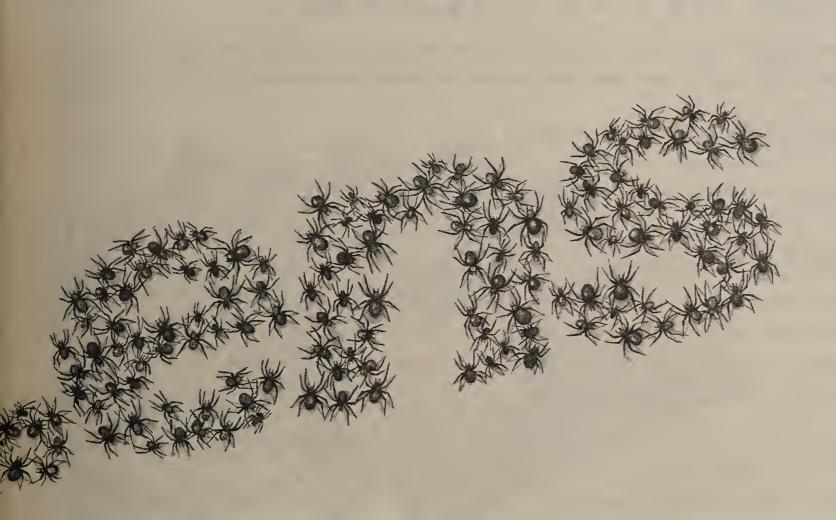
In addition to credit verification, the net will support applications such as merchandise replenishment, which will be based on the collection and processing of POS information, and the Checkout Channel, a video service displaying advertisements at checkout lines.

The network hub will be installed by year end; deployment of VSATs at the 71-store Super Fresh chain based in Philadelphia has already begun, Rolandelli said. A&P officials expect to expand the VSAT net to encompass all of its 1,300 stores by the mid-1990s. Scientific-Atlanta will likely handle management of the VSAT net, Rolandelli said.

The fixed cost of the VSAT net vs. the unpredictable costs of using terrestrial nets clinched A&P's decision, Rolandelli said. "It just turned out to be a dollars and cents issue," he said, declining to provide specific savings estimates.

Philip Arst, a principal consultant with Regis McKenna, Inc., a high technology marketing consulting firm in Costa Mesa, Calif., said A&P's move to VSATs could result in other supermarkets doing the same.

"It'll depend on how A&P's sales do," Arst said. "If the company's revenue starts growing because customers are finding it more convenient to use debit cards at A&P stores, other supermarkets are certain to look at VSAT." ⊿

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Link Notes

LANNET Data Communications, Inc. has announced it was awarded a contract to provide all international paging services at the Summer Olympic Games in Barcelona, Spain, next month. The company has installed an Ethernet 10Base-T net based on its MultiNet intelligent hub that will support Novell, Inc. NetWare local-area nets.

According to Compania Telefonica Nacional de Espana, Spain's post, telegraph and telephone administration, more than 2,000 paging requests per hour will be relayed across the network during the games.

Allied Telesis, Inc. has rolled out AT-3612T, a 12-port 10Base-T hub that can function as a stand-alone concentrator or be cascaded in a chassis with seven other AT-3612Ts via an interrepeater bus, which allows it to provide as many as 96 10Base-T ports. The hub can be attached via an optional connector to an Ethernet backbone based on unshielded twisted pair, thick-or thin-wire coaxial cable or fiber-optic cable. The AT-3612T will begin shipping in July and costs $1,795. **Z**

Hub vendors boost network management capabilities

By Maureen Molloy
Senior Writer

DALLAS — Local-area network hub makers NetWorth, Inc. and Ungermann-Bass, Inc. are forging partnerships with third-party vendors to enhance their respective network management offerings.

NetWorth recently announced a Microsoft Corp. Windows-based hub management application for Novell, Inc.'s NetWare Management System (NMS), while UB last week announced the integration of ProTools, Inc.'s remote monitoring and analysis applications into its NetDirector platform.

NetWorth's new HubView management application runs on Novell's NMS net management software platform and augments its server and workstation management capabilities by providing a Windows graphical user interface to control NetWorth's Series 4000 hubs.

Loaded on NMS alongside other element management systems,

HubView will gather and report an array of port, module and hub performance statistics. It will also allow users to enable and disable individual ports and configure backup links for fault tolerance via the Simple Network Management Protocol.

"Our goal is to keep net management as simple as possible," said John McHale, chief executive officer of NetWorth. "With the integration of our hub management technology with Novell's server and workstation management technology, users have one console that can do it all."

The SNMP-based NMS — like SunConnect's SunNet Manager and Hewlett-Packard Co.'s OpenView — is designed to serve as a platform for third-party element management applications, enabling administrators to manage multiple network components.

"We believe NMS will become the network management platform in many enterprise networks, and we want to provide a

Time/LAN to get software upgrades

By Maureen Molloy
Senior Writer

WOODCLIFF LAKE, N.J. — Ascom Timeplex, Inc. last week announced several enhancements to its Time/LAN 100 bridge/router and FDDI Concentrator*32 as well as to the element management system (EMS) for those products.

The new bridge/router and Fiber Distributed Data Interface concentrator features support for additional protocols and increased token-ring support.

The Time/LAN 100 EMS enhancements include automatic discovery and topology mapping capabilities, a graphical user interface and support for other vendors' Simple Network Management Protocol-based Management Information Bases (MIB).

Automatic discovery operates as a background process to discover configuration information and upload it to the management

system from devices on Transmission Control Protocol/Internet Protocol networks, thereby eliminating the need for manual entry.

Additionally, the management system, which runs on a Sun Microsystems, Inc. SPARCstation, uses a new automatic topology feature to draw maps from the collected data and continually update the network's status.

The EMS has been outfitted with a new MIB compiler to automatically load any other vendor's MIB extensions. To further simplify management, Ascom Timeplex added X Window and Open Software Foundation, Inc. Motif graphical user interfaces as well as a real-time performance monitoring capability.

The Time/LAN 100 EMS software is available now and priced at $10,000 without Sybase, Inc.'s relational database system and $16,000 with it. The relational database system is required to run the EMS.

Remote SAP and RIP

Ascom Timeplex also announced several enhancements to its Time/LAN 100 bridge/router and FDDI Concentra-

Riding the fiber rails through Charlotte

■ City MultiHub locations
— City fiber net
■ County MultiHub locations
— County fiber net

Fire station No. 1
East Fifth Street
East Fourth Street
City hall
Law enforcement center
Criminal courts building
Intake center East Third Street
Charlotte-Mecklenburg Government Center
County and courts office building
Civil courts building

Charlotte and Mecklenburg County recently replaced their point-to-point leased line setup with 2 fiber-optic rings that are created by using 8 Fibronics International, Inc. multiplexed hubs.

GRAPHIC BY SUSAN J. CHAMPENY   SOURCE: CITY OF CHARLOTTE, N.C.

City moves SNA net to hub-based backbone

Migration to private fiber saves Charlotte and Mecklenburg County thousands each month.

By Skip MacAskill
Staff Writer

CHARLOTTE, N.C. — What began as the simple addition of a new site to this city's SNA network evolved into a complete net overhaul that led to the development of a sprawling LAN internetwork.

Two years ago, when Charlotte's Communications Information Systems department was handed the task of tying the city's new fire station into its existing Systems Network Architecture net, it took the opportunity to evaluate the entire network and propose an overhaul.

Because the city shared data processing facilities in the Charlotte-Mecklenburg Government Center (CMGC) with the County of Mecklenberg, it was decided to include the county's SNA network in the scope of the redesign.

"It was getting cost-prohibitive to make all these point-to-point connections," said Guy Hutchins, the communications manager of the Communications Information Systems department. "We wanted one system that could handle all current needs as well as provide for future growth."

The new network, which is based on two fiber rings created by a series of Fibronics International, Inc.'s MultiHubs, has allowed the city to reduce the num-

ber of costly leased lines it employs by multiplexing numerous lines onto a shared backbone, thereby saving thousands of dollars in monthly charges.

Do-it-yourselfers

By integrating voice, video and data services on Fibronics' Unimux platform, Hutchins has been able to reduce hookup times because the net now consists of private fiber instead of public network facilities.

"Because we're not waiting on the local phone company and doing things ourselves, we can do in four hours what used to take us three weeks," he said.

It wasn't until Hutchins and his staff began a network inventory that they realized just how unwieldy the net had become. The SNA network is comprised of an IBM 4381 mainframe located at the CMGC data center that was connected to a 3725 front-end processor, which was supporting an undetermined number of local- and wide-area lines.

These lines branched out across five blocks to link devices — such as IBM 3174 cluster controllers and Application System/400s in several city buildings — to the CMGC data center, providing communications services to 26 city departments and more than 4,500 employees.

Hub vendors boost net mgmt. abilities

continued from page 23

tight fit into Novell's management strategy," said Martin Lattman, NetWorth's vice-president of marketing. "With HubView, we're writing the graphical user interface and port-level control software so that, from an NMS console, a user can manage our hubs by clicking on an icon."

HubView will be available in the first quarter of 1993. Pricing has not been set.

UB is looking to aid users in simplifying network management by integrating Pro-Tools' Network Control Series (NCS) monitoring and analysis applications into Net-Director. Together, the applications will allow an administrator at a central location to view and troubleshoot individual LANs on a network.

Although UB already resells ProTools' applications, beginning next month, the applications will be ported directly to the NetDirector platform, enabling it to offer device management while the NCS applications provide protocol analysis.

The first application, called Corner-stone Agent, runs on a remote NetDirector station and provides monitoring and analysis at remote sites, allowing administrators to gather statistics, set alarms, filter data and perform protocol analysis.

The second application, called Foundation Manager, offers advanced analysis and management capabilities at the enterprise level by enabling the administrator to view all the Cornerstone Agents on the net.

Like NetDirector, both applications support the SNMP remote monitoring Management Information Base.

With this integration, Foundation Manager can be directly invoked from within NetDirector and the two can run on a common platform. The device discovery mechanism within Foundation Manager — and the ability to integrate the NetDirector database — eliminates duplicate data entry and ensures better data integrity.

In addition, NCS applications can support traces from other analysis products such as Network General Corp.'s Sniffer.

NCS will be available on NetDirector beginning next month. Pricing varies depending on configuration, with a typical starting price of $18,995. **Z**

City moves from SNA to hub-based internet

The county had a separate but similarly configured network connecting its facilities.

"We had no idea how many communications devices existed when we first started," Hutchins said. "There were hundreds of connections between buildings, a conglomeration of mainframes and [other] IBM systems everywhere."

Hutchins convinced city and county officials that it was time to integrate and consolidate communications facilities to reduce expenses and prepare for future needs.

Charlotte then put the project out for bid and selected Fibronics' plan to provide a high-speed fiber network that would integrate a broad range of multivendor equipment.

"We were interested in getting the most bang for our buck from the new system, and the versatility of Fibronics' [MultiHub] gave us that," Hutchins said.

The MultiHub is an intelligent fiber-optic hub with a 70M bit/sec bus that supports Ethernet and token-ring local-area networks and has time-division multiplexing capabilities.

Hutchins used eight MultiHubs located in separate buildings to create two 70M bit/sec fiber rings — one connecting four city buildings and the other linking four county buildings.

The fiber rings operate separately but are cross-connected at either the CMGC data center or MultiHub location in each building if needed.

The MultiHub strategy also protected Charlotte's investment in its IBM installed base because the device can support direct connections to IBM 3270 and 5250 controllers. Its multiplexing features let a number of such controllers share the same line, thereby reducing the number and cost of point-to-point connections.

The MultiHub can also support other interfaces such as RS-232, V.24, V.25, V.35 and T-1.
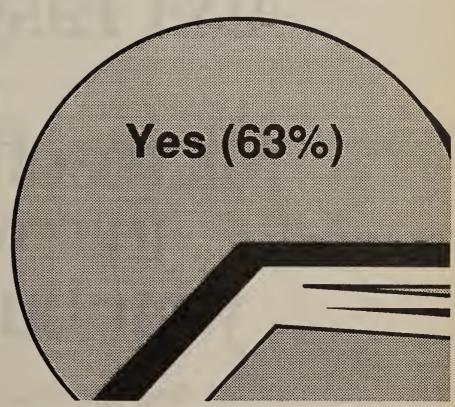
The new network — which is managed by InterView, Fibronics' Simple Network Management Protocol-based net management system — currently supports 96 asynchronous devices, eight synchronous devices, 112 AS/400 and 4381 terminals, six T-1 lines, and 64 multimode and 32 single-mode fiber ports.

"This was a cost-effective, reliable way for us to go, and we're very happy with the results," Hutchins said. "It will serve as a protected investment for the city for a long time." **Z**

They're coming!

Are *you* ready?

Try this simple quiz...

1. How many viruses were written in 1991?

2. Can a "data disk" created without the /S option in FORMAT contain a boot sector virus?

3. What is the most common source of virus infection in the office?

4. What percent of virus victims report that the virus caused very little or no damage?

5. What products remove all 16 common file viruses?

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AT&T
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GLOBAL SERVICES

Rolm Co. beat out AT&T and Northern Telecom, Inc. to capture first-place honors in overall customer satisfaction for the first half of 1992 in a recent survey of private branch exchange users by Dataquest, Inc., a San Jose, Calif., research and consulting firm.

Demand for fax products and services

Millions of dollars in sales

- Fax boards for stand-alone PCs: $184.7 / $62.9
- Fax network services: $156.8 / $15.3
- Fax kiosks: $12.8 / $5.0

1996
1991

*A fax kiosk is a fax machine that can be used by the public to send and receive faxes.

GRAPHIC BY SUSAN J. CHAMPENY   SOURCE: FROST & SULLIVAN, INC., NEW YORK

Regulatory Update
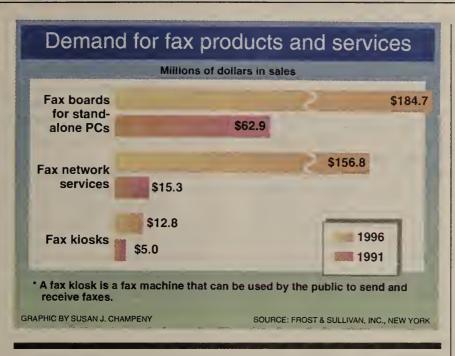
The **Federal Communications Commission** earlier this month said it will kick off a review of AT&T's price cap regulation this summer. The agency switched AT&T from rate-of-return to price cap regulation in 1989.

Rate-of-return regulation allows a carrier to receive a predetermined percentage of profit, whereas price caps set limits on the rates a carrier can charge but impose fewer constraints on profit levels. FCC regulators claim price caps give carriers an incentive to cut costs and become more efficient so that they may retain higher profits.

But users have expressed fears that price caps will encourage carriers to cut back on essential expenses such as maintenance and network investment in order to increase profits.

The FCC last week acknowledged that since it has implemented price caps, AT&T's network blockage rate has been somewhat higher than under rate-of-return regulation and the carrier has experienced some significant outages recently. However, "the commission has found there is no directly traceable connection between AT&T outages and price cap regulation," the FCC said. **Z**

AT&T intros Megacom Plus outbound calling service

New offering is targeted at midsize customers.

By Bob Wallace
Senior Editor

BASKING RIDGE, N.J. — AT&T has announced Megacom Plus, an outbound calling service for users that spend $36,000 to $360,000 a year on long distance and have multiple locations.

The first in a series of services aimed at midsize companies, Megacom Plus will enable users to call domestic locations and more than 200 other countries.

Tariff analysis experts say Megacom Plus is a competitive response to MCI Communications Corp.'s Vision service, which was announced in mid-1990, and Sprint Corp.'s Clarity, which debuted this year. Both are aimed at midsize firms.

"AT&T really didn't have a product designed specifically for medium-sized companies with multiple locations," said Bob Self, president of Market Dynamics, Inc., a New York tariff analysis firm. "Further, MCI totally caught AT&T by surprise when it announced Vision."

Standard Megacom Plus features include account codes that will enable network managers to assign calling privileges by employee, location or work group.

The service can be accessed using either switched or dedicated links. Switched access locations can be provisioned in five days and dedicated access sites can be brought on-line in 30. Users that need the service faster can pay an expediting charge.

The service also supports Static Integrated Network Access (SINA) for dedicated access sites.

One of two versions of SINA enables users to integrate inbound and outbound switched services on a dedicated link, while the other enables users to integrate private lines as well.

Optional features include a personal computer billing package containing call detail and the carrier's remittance that can be used to generate 56 standard reports or customized reports. The billing package carries a onetime $250 charge per location and a $10 monthly charge per location, which is waived for users that spend $20,000 or more monthly.

AT&T also offers MegaWatch, an optional feature under which the carrier monitors the performance of transmission facilities and notifies customers when circuit quality degrades. MegaWatch will cost $300 a month per location with a onetime $100 charge per site.

Megacom Plus uses an eight mileage-band pricing scheme for domestic interstate service. Daytime rates for sites supported by switched facilities vary by band from 0.224 cents a minute for a one- to 55-mile call to 0.244 per minute for a call between two sites 4,251 to 5,700 miles away. Evening rates for those two calls would be 0.179 and 0.195 cents per minute, respectively.

Daytime rates for dedicated sites range from 0.162 cents a minute for a one- to 55-mile call to 0.182 cents per minute for a call between sites 4,251 to 5,700 miles away. Evening rates for those same two calls would be

Study raises concerns about National ISDN

ICA survey finds users unfamiliar with project, cites problems with integrated voice/data service.

By Bob Wallace
Senior Editor

DALLAS — Despite concerted efforts by the telecommunications industry to promote National ISDN, many users still have little knowledge of the project, according to an International Communications Association (ICA) member survey obtained by *Network World*.

The survey of 100 top network executives, conducted at the ICA's recent annual conference in Atlanta, shows slow growth for the visibility of National ISDN, which is an effort to provide interoperability between Integrated Services Digital Network equipment and services.

Three-quarters of the ICA members surveyed — who represent some of the nation's top spenders on network technology — said they knew little about National ISDN. In addition, they said other technologies are serving the needs that ISDN was supposed to meet, and they outlined a number of concerns about ISDN, ranging from low service availability to high equipment costs.

A blow to proponents

The results are a disappointment for ISDN proponents, particularly Bell Communications Research and the Corporation for Open Systems International (COS), which have spent a good deal of time and money spearheading the National ISDN movement.

Bellcore, COS, AT&T Network Systems, Northern Telecom, Inc., Siemens Stromberg-Carlson and two users — Eastman Kodak Co. and General Motors Corp. —

Infonet software to help users monitor net services

EL SEGUNDO, Calif. — Infonet Services Corp. is expected to introduce soon a net management offering that will enable users to monitor the performance of its network services.

According to sources, the software product, which has not been named, will allow users to manage Infonet's domestic and international data communications services from a single workstation at the user site.

The software runs on a Digital Equipment Corp. DECStation 3100 or a Sun Microsystems, Inc. SPARCstation under Unix and provides an X Window System graphical user interface.

The system, linked via a dial-up or dedicated line to an Infonet management center, will enable users to monitor in real time the performance of Infonet's global electronic data interchange, messaging, public router and frame relay services.

Although Infonet declined to confirm reports about the product, sources said it provides a color-coded, graphical representation of all network links and devices, which users can click on to pull up historical performance information.

Tracking problems

Customers will also be able to use the product to track problem resolution once Infonet opens a trouble ticket. Clicking on a node or link icon will show when the problem began, its cause and a brief explanation of what steps are being taken to solve it.

The system can be used to access a variety of performance reports on a daily, weekly or monthly basis. Reports will include a list of all trouble tickets opened, the amount of data transmitted with errors and network traffic volumes.

Infonet is testing the net management system in-house and plans to begin a beta test in about 30 days with one of its existing customers.

The carrier has not yet established pricing for the system. **Z**

Success of ISDN hanging in the balance

CHICAGO — Users and vendors at the recent SuperComm '92 conference here said they hope an upcoming National ISDN venture will spur a comeback for the technology, but attendees agreed that if ISDN sputters now, its future will be in jeopardy.

Integrated Services Digital Network has been discussed as a global digital pathway for voice, data and video for about 10 years. The service was introduced in the mid-1980s but never lived up to expectations, largely due to incompatibility problems.

In order to resolve the technical snags, carriers and vendors began work last year on a new standardized version of the technology, National ISDN 1. Products based on the standard are expected to be officially introduced in November.

At the conference, these vendors and carriers provided more details about the Transcontinental ISDN Project (TRIP) '92, which involves the linkage of ISDN switches throughout North America and will feature user-hosted open houses and a technology exhibit designed to showcase ISDN applications.

But user concerns about ISDN remain, especially ubiquitous availability, pricing and upgrades from current products.

"1992 to 1993 is a critical time frame for ISDN," said Gary Jones, manager of communications technology at JCPenney Business Services, Inc., during a panel discussion at SuperComm. "The market can grow significantly if 1992 and 1993 are good years for ISDN. If not, we're going to be forced to other technologies."

Michael Collins, an internal telecommunications consultant at Sara Lee Corp., agreed. "If [ISDN] doesn't make it this time, people will just forget about it."

Collins said only nine of Sara Lee's 42 divisions currently have ISDN available in their area. ISDN is on the drawing board for another eight, but ISDN is not even under discussion by carriers for 25 of the divisions, or 60% of Sara Lee's operations in the U.S.

Jones wants ISDN to support point-of-sale terminals for JCPenney Company, Inc. locations nationwide, but he said, "I don't see it being available in the hinterlands."

He is also concerned about pricing. Jones and Collins emphasized that ISDN should be tariffed rather than offered as an individually negotiated service, as is done by some carriers now. "Especially in the planning mode, you've got to know what the price is going to be," he said.

ISDN vendors may wince at such comments, but they also admit there is truth in users' frustrations with ISDN. "TRIP '92 is pivotal because it has taken so long to bring ISDN to the market," said D.W. Jones, vice-president of network strategic planning for BellSouth Corp. "It's a departure from what has been some fumbling around."

However, he is optimistic ISDN will live up to its potential. "We've put tons of money into ISDN; we do believe there's a market for it."

Officials from Bell Communications Research and the North American ISDN Users' Forum last week published a list of the 20 National ISDN 1 switches that will be linked via long-haul networks. Those switches will become a permanent ISDN infrastructure, said Richard Aloia, co-chairman of TRIP '92.

Additionally, 65 firms have agreed to host open houses that showcase various ISDN applications.

One of the users is Stan Kluz, a data communications engineer at the Jet Propulsion Laboratories (JPL) in Livermore, Calif. The JPL is one of the largest ISDN installations in the U.S., with 10,000 ISDN lines.

Although ISDN has been used for applications such as file transfer, electronic mail and host access in the campus environment, Kluz said, "We are an ISDN island at this point."

Kluz supports National ISDN 1 and the TRIP '92 effort, but he is concerned that unless the JPL upgrades its equipment, it will not have access to many of the new features available with National ISDN 1.

— *Antta Taff*

Study raises ISDN concerns

launched the effort in March 1991.

Of the 100 respondees, 75% indicated a low level of knowledge about National ISDN; many had not even heard of the project. As a result, the survey concludes that user education should be the No. 1 priority of National ISDN proponents.

Worse still, the survey shows that users believe there are better technologies than ISDN. "Competition continues to advance at a more rapid pace," the survey said. "Unless ISDN can stay responsive to other emerging technologies, it will not become the technology of choice for intra-company networking."

The survey did not indicate which technologies users discussed.

User concerns

Users continue to see disadvantages of ISDN. According to the survey, users think ISDN costs more than the alternatives. In addition, they have concerns about buying and maintaining new ISDN-compliant equipment and spending money to modify exist-

ing applications to support ISDN or developing new ISDN applications.

"Thus far, the benefits of ISDN applications do not exceed their cost. Companies also stay away from piecemeal solutions, so nationwide availability is a must," the survey said.

Users also said there was not one "killer" application that companies could use to easily justify ISDN.

Videoconferencing and LAN interconnection were ranked as the most important applications for ISDN by most respondents, while residential access to business databases was listed as the least important application.

Users were "fairly lukewarm" on using ISDN to support telecommuting, although this application was ranked first in a recent study by the North American ISDN Users Forum.

The group conducting the ICA survey concluded that "expectations change when users become more knowledgeable about ISDN."

Survey results also showed that the main benefits users see in ISDN are larger dynamic bandwidth, caller identification and shared access for voice and data. ⊡

Ameritech initiates broad testing of PCS technology

By Anita Taff
Washington Bureau Chief

CHICAGO — Ameritech recently kicked off what it is billing as one of the nation's largest and most comprehensive trials of personal communications services (PCS) at the SuperComm '92 show here.

By the end of the year, the trial will include some 1,000 users in three areas of Chicago — the downtown business district, a residential neighborhood just north of the downtown area and Arlington Heights, a suburban area about 30 miles from downtown. The trial will involve multiple types of PCS technology and applications.

One of the main objectives of the trial is to determine whether PCSs, which use a low-power transmission technique known as spread spectrum, can share the 1,850- to 1,900-MHz frequency currently assigned to microwave users. Additionally, the trial will test price levels, residential and business applications as well as the ability of Ameritech's wire-line network to support customer calling features on the PCS net.

PCS has become a hot technology over the past year, driven in part by the popularity of mobile communications and because it is an all-digital technology capable of supporting voice and data applications, including wireless local-area networks. It is also seen as the first real hope for competition in the local loop.

PCS technology could be ideal for businesses with a lot of employees in field sales or service.

Ameritech's trial will proceed in four phases, beginning with one-way outbound calling, then adding paging capabilities, two-way calling and handoff of calls between PCS cells in the network.

Unlike other PCS trials, Ameritech will test three different types of PCS technologies — time-division multiple access (TDMA) and frequency-division multiple access (FDMA) using equipment provided by Motorola, Inc. and code-division multiple access (CDMA) using technology from Omnipoint Corp., a tele-communications equipment vendor.

Motorola will supply 100 base stations and 1,000 telephones based on FDMA and TDMA technology, and Omnipoint will provide 10 base stations and 25 phones using CDMA technology.

Users may be inside or outside buildings, but they must be within 200 yards of a base station. The base stations will be tied into Ameritech's network via Integrated Services Digital Network Basic Rate Interface lines.

Ameritech has arranged to get reports from microwave users in the Chicago area on any possible interference. If interference occurs, Ameritech will have to discontinue or modify the trial.

Microwave users from utilities, railroads, public safety operations and other industries have strongly protested attempts by the Federal Communications Commission to allow PCS to share their frequency.

They claim that such sharing could degrade their service and cause dangerous interruptions in their operations. They also say that if they are forced to move to other frequencies, it will cost hundreds of millions of dollars and could reduce the reliability of their networks. ⊡

AT&T intros Megacom Plus

0.13 cents per minute to 0.146 cents per minute. All calls are billed on a 30-second initial period and at six-second increments.

Market Dynamics' Self said Megacom Plus rates are 5% to 7% above Vision rates and are also higher than Clarity's rates.

Monthly charges include a $100 basic account fee, which is waived when $7,500 usage is reached; a $5 charge per switched location, which is waived with 10 sites; and a $50 charge per dedicated location, which is waived after one site.
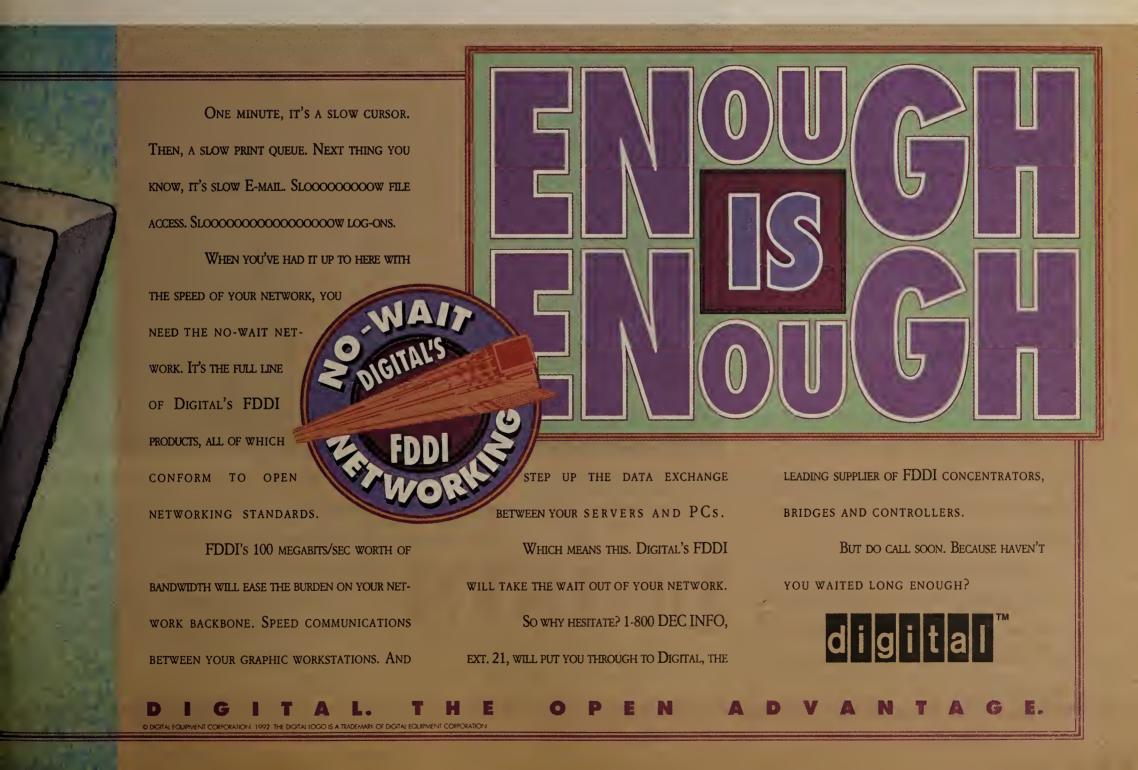
AT&T will charge users a $50 onetime network billing arrangement per location.

The carrier will also charge a $10 onetime fee for each switched site that uses Megacom Plus and a $545 onetime charge for each dedicated access location.

Megacom Plus will carry volume discounts based on monthly usage. They range from 10% for $7,500 to $10,000 of service to 17% for usage over $30,000.

Megacom Plus is scheduled to be available through 540 points of presence on July 29. ⊡

It's curious what passes for interoperable computer systems these days.

Lately, many computer makers are claiming, "Our systems are open." But their customers are asking, "Open to what? *Your* computer environment? Or ours?"

The point is well taken. Because computers should work with systems already in place, the customer's existing investment. And with systems yet to come, the customer's future investment. It's a big assignment—*interoperability,* enabling information to move freely across different computer environments.

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Perhaps you hadn't realized that Unisys is a pioneer at delivering information solutions over open information networks. And among the first to appreciate that open systems are only one stop on the drive to interoperability.

"No supplier is doing more to respond to its customers' requirements for interoperability across an entire product line than Unisys," reports the Aberdeen Group. We've brought the benefits of interoperability to customers such as The Limited, the State of Ohio, Banque Bruxelles Lambert, and more. It's all part of our focus on the customer. And a prime reason 60,000 Unisys customers in 100 countries rely on us for solutions to fit their needs. Not merely our own.

Call us at 1-800-448-1424, ext. 171. Whatever shape your systems are in, we can shape a solution equal to the challenge.

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Store & Forward

Digitalk, Inc. announced a new version of its object-oriented programming environment, Smalltalk/V for Windows, that simplifies the task of developing programs using Microsoft Corp.'s popular Windows interface.

Version 2.0 hides the complexity of Windows from the developer by supporting new features that provide for better status information, simpler access to functions, improved performance and better help facilities.

Smalltalk/V for Windows will support the Dynamic Data Exchange interface in Windows, which allows applications to share data, as well as Dynamic Link Libraries, which allow other programs to be executed within Smalltalk applications.

Smalltalk/V source code is compatible with Digitalk's Smalltalk/V programming environment for OS/2. This lets programmers develop and deliver applications on OS/2 and Windows simultaneously.

Smalltalk/V for Windows, Version 2 costs $499.95 and is available now. Digitalk can be reached at (310) 645-1082.

Oracle V. 7 could fuel user move to dist. applications

Analysts see new release as catalyst for change.

By Timothy O'Brien
West Coast Bureau Chief

What do you get when you combine $1.3 billion worth of database market muscle and powerful new distributed database technology?

Perhaps just the spark needed to ignite widespread acceptance and deployment of distributed applications, according to analysts and industry leaders commenting on Oracle Corp.'s introduction of Version 7 of its relational database management system.

These observers said Oracle's market influence and the new network-oriented capabilities offered in Version 7, expected to be available by year end, are likely to prompt more and more users to develop applications that leverage their investments in network infrastructure.

"We're trying to move distributed computing along much more rapidly. We want to push the whole industry forward," said Fred Cutler, vice-president of business development for Oracle.

And analysts said Oracle may just achieve that goal. "Users want to move from centralized systems to distributed systems.

To the extent Oracle has made that easier, it will be a tremendous stimulus for the industry," said John Rymer, vice-president at the Patricia Seybold Office Computing Group in Boston.

In many companies, networks are primarily used for message passing, terminal-to-host access and simple file transfer. True client/server database access is limited, particularly over wide-area networks.

Before moving ahead with distributed database implementations, users have wanted to see solutions for such thorny issues as fault tolerance and recovery, reliability, multiprotocol transparency for data access, and optimization of query and transaction processing to minimize network transmission costs.

In addition, widespread acceptance of distributed applications has been slowed by user concerns about administration and management of distributed databases.

In Version 7, Oracle has provided ways to hide the complexity of deploying distributed applications by making it easier to access data on multiple computers.

IBI to port EDA/SQL to Unix servers

By Wayne Eckerson
Senior Editor

NEW YORK — Information Builders, Inc. (IBI) next week will announce that its multivendor database access software will be ported to Pyramid Technology Corp.'s Unix servers.

IBI officials said the firm's Enterprise Data Access (EDA)/SQL software will soon be available on Pyramid's MIServer T Series Reduced Instruction Set Computing (RISC)-based machines and Pyramid's MIServer S Series computers, which are based on MIPS Computer Systems, Inc.'s RISC processors. The announcement is scheduled to be made at the Database World Exposition in
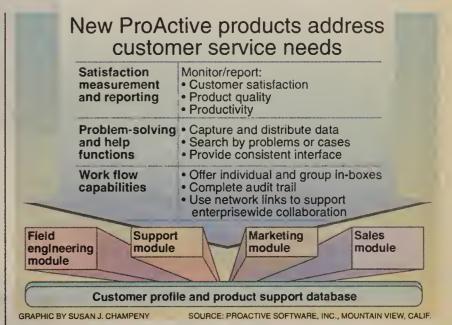
Boston this week.

EDA/SQL is client/server software that enables SQL-based applications to access data in relational and nonrelational database management systems across corporate networks. EDA/SQL is the cornerstone of IBM's Information Warehouse framework for accessing databases and files throughout a corporate network.

Pyramid's support of EDA/SQL will enable companies downsizing from mainframes to Unix servers to give desktop users access to local and departmental data on the Unix machines and corporate data elsewhere on the network.

Scott Grisanti, product marketing manager for IBI's Unix division, said EDA/SQL will be available for MIServer T Series multiprocessors in July and S Series multiprocessors in the third quarter.

EDA/SQL client software enables applications to communi-

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Customer profile and product support database

GRAPHIC BY SUSAN J. CHAMPENY   SOURCE: PROACTIVE SOFTWARE, INC., MOUNTAIN VIEW, CALIF.

Client/server tools target sales, service

ProActive readies for July rollout of applications using standard front ends, SQL database servers.

By Timothy O'Brien
West Coast Bureau Chief

MOUNTAIN VIEW, Calif. — Start-up ProActive Software, Inc. is readying for the launch next month of its client/server applications for sales and customer service and support.

In its initial release, the software will consist of modules supporting departmental functions, including engineering/quality assurance, sales, marketing, customer service and support.

The modules enable users to store customer and product information in a variety of leading SQL database servers running on Unix servers and to collaborate on a wide range of customer and product functions commonly handled by sales, support, service and engineering operations.

"Our software provides a way to gather, manage and distribute information regarding a company's customers and product data," said Steve Goldsworthy, president of ProActive.

Even though modules are offered for different departments, ProActive employs a consistent user interface across the line.

Client software will work with Microsoft Corp.'s Windows. Support for Open Software Foundation, Inc.'s Motif interface and Apple Computer, Inc.'s Macintosh will follow. The software works with such database servers as Oracle Corp.'s Oracle Server or Sybase, Inc.'s SQL Server running on a Unix server over a Transmission Control Protocol/Internet

Protocol local-area network.

It is possible to customize or modify the system without any programming by using ProActive's Dynamic Application Dictionary tool. In addition, since the software supports emerging desktop and database server standards, it is possible to use SQL report writer programs or even spreadsheets to manipulate data or add new reports.

ProActive is basing many of the features in its product around the customer and product database. By storing information centrally, it is possible to provide faster customer response with an up-to-date, on-line history of previous inquiries.

Using key word searches, a user can access information on similar problems or track related memos, technical documents, facsimiles or electronic mail.

The software manages the assignment and follow-up of tasks among users on the network and coordinates collaboration among users in departments or work groups. It can escalate problem response by notifying appropriate managers through messaging. The software also provides reports that let managers monitor service and support operations, and assess performance of their organization.

ProActive was founded in 1990 as Information Workbench, Inc. by Goldsworthy and Roger Sippl, chairman and founder of Informix Software, Inc. and now a ProActive board member.

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This summer, N.E.T. unveils a plan that will bring nations together more effectively than Henry Kissinger.

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INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS, ALLIANCES AND FINANCIALS

People & Positions

Telebit Corp. last week announced that **Edwin Adams**, former vice-president of Oracle Corp.'s headquarters sales division, has joined Telebit as senior vice-president of sales and marketing, a newly created position at the Sunnyvale, Calif.-based company.

Adams, who will be responsible for Telebit's product marketing and worldwide sales organizations, will report directly to **Michael Ballard**, president and chief executive officer.

Pacific Communication Sciences, Inc. (PCSI) last week announced that **Steven Gardner**, formerly a staff engineer at Qualcomm, Inc., has joined PCSI as a principal member of the technical staff.

In his new position, Gardner will lead the hardware design effort to develop a cellular digital packet data system to enable data transmission across existing cellular nets.

James Patty Jr. has been named vice-president of sales for major and national accounts at **Metromedia Communications Corp.**, a long-haul carrier based in East Rutherford, N.J. He will be responsible for the development and expansion of the major and national accounts sales groups.

Previously, Patty was executive vice-president for sales, marketing and business development at CE Services in Medford, N.J.

Global Village mini-profile

Founded: June 1989

Employees: 65

Financials: Privately held; estimated 1992 revenue of $30 million; recently completed second round of venture capital funding totaling over $4 million.

Primary business: **TelePort** – Data/fax modem for Apple Computer, Inc. Macintosh computers.
PowerPort – Data/fax modem for Apple's PowerBook laptop computers.

SOURCE: GLOBAL VILLAGE COMMUNICATION, INC., MOUNTAIN VIEW, CALIF.
GRAPHIC BY SUSAN J. CHAMPENY

Start-up secures funds and plots Apple-linked future

Also unveils new internal PowerBook modems.

By Bob Brown
Senior Editor

MOUNTAIN VIEW, Calif. — Global Village Communication, Inc. last week said it has secured a second round of funding that will enable the three-year-old firm to further penetrate the Apple Computer, Inc. computer connectivity market.

Global Village raised more than $4.4 million from three venture capital firms — Kleiner Perkins Caulfield & Byers, Sequoia Capital and Sigma Partners — and several private investors. The Macintosh and PowerBook modem vendor took in about $1.4 million in its first round of venture capital funding last October.

Global Village, which was founded in 1989, plans to use the new funds for working capital, research and development, marketing and to grow its staff.

Moving on up

The funding is just one of a handful of recent events raising Global Village's profile in the network market, not the least of which was Apple's introduction of its PowerBook portable computer last fall.

Global Village began shipping its first PowerPort facsimile/modem for the PowerBook in December, and sales of the modem have tracked nicely along with the sensational sales of the PowerBook, which became the best selling laptop on the market almost overnight.

Last week, Global Village moved to leverage its already strong position in the PowerBook modem market by introducing a line of three new internal PowerPort fax/data modems for Apple's PowerBook computers.

These modems — Power-Port/Gold, PowerPort/Silver and PowerPort/Bronze — differ from one another in throughput speed (2,400 bit/sec to 14.4K bit/sec) and price ($295 to $795). They are designed to take advantage of the communications capabilities built into the PowerBook and complement Global Village's TelePort modems for desktop Macintoshes.

The PowerPort modems are targeted largely at companies setting up automated tracking systems for their field sales and engineering forces, among other users, and are intended to let PowerBooks participate in corporate nets just like any other computer.

Anticipating a big year fueled by sales of the new products, Global Village bolstered its management ranks in April by hiring Tyrone Pike as president and chief executive officer. Pike founded systems integrator and software developer LANSystems, Inc. in 1983 and later served as manager of strategic planning and business development at Intel Corp.

In an interview with *Network World,* Pike said he was attracted to Global Village by the opportunity to run a small company again. Global Village is expected to rack up some $30 million in sales this year, he said.

Pike said Global Village's growth potential is huge, given the success of Apple's Power-Book. Global Village already sells about as many modems for PowerBooks as it does for desktop Macintoshes, he said.

Continuing to work closely with Apple will be among the keys to Global Village's success. "We do all we can to make sure that

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Bypass carrier to deploy frame relay

Move could encourage others to do the same, speeding up delivery of end-to-end frame relay.

By Bob Brown
Senior Editor

TAMPA, Fla. — Intermedia Communications of Florida, Inc. (ICI) next month will become the first alternate access carrier to offer frame relay and the first carrier to use switches from start-up Cascade Communications Corp.

ICI's foray into frame relay could prove beneficial to users by spurring other bypass carriers to follow suit and prodding the regional Bell holding companies to accelerate their frame relay deployment schedules. This could lead to faster availability of end-to-end frame relay services based on local and long-haul offerings.

The Frame Relay Transport Service (FTS) will also provide insight into Cascade's recently announced series of Reduced Instruction Set Computing-based switches, which are designed for use in both public and private nets ("Start-up rolls out frame relay switches," *NW,* May 11).

ICI and other alternate access carriers are moving aggressively to expand their product portfolios beyond private lines in response to local exchange carrier efforts to match the bypassers' traditional strengths, which are low prices, speed of delivery and customer service.

"Even though the [RBHCs] are getting better at doing some of the things that have caused them to lose accounts, the alternate access vendors still have the inherent advantage of being small enough to be able to make fast decisions and quickly deploy new equipment and enhanced services," said Warren Williams, a senior consultant at The Eastern Management Group, a Parsippany, N.J., market research firm. Frame relay is a good example, he added.

"We decided that, as a competitive access provider, we needed to offer some additional ser-

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INDUSTRY BRIEFS

Banyan adds support partners. Banyan Systems, Inc. last week announced that Cabletron Systems, Inc., Dell Computer Corp., FairCom Corp., Proteon, Inc. and Oracle Corp. have joined its technical alliance program to resolve problems occurring on customers' multivendor networks. Under the Banyan Strategic Support Alliance program, the vendors will share technical information and engineering support in troubleshooting joint customers' networks.

Cabletron posts financials. Cabletron Systems, Inc. last week reported record first-quarter results for the period ending May 31. The Rochester, N.H.-based company reported net sales of $88 million, a 45% increase over the first-quarter results of last year. The company said first-quarter international sales grew to $27.2 million, a 42% increase. Cabletron reported net income of $17.6 million, compared to $12.2 million in the corresponding quarter of the preceding fiscal year.

Vitalink, DEC expand reseller deal. Vitalink Communications Corp. has announced that Digital Equipment Corp. will resell its TransRING token-ring bridge. DEC, which struck previous agreements to resell Vitalink's TransLAN Ethernet bridges and TransPATH multiprotocol bridge/routers, now handles Vitalink's entire 5000 Series product line as well as Vitalink's network management offerings. The two companies will also be exploring possible joint marketing efforts.

Bypass carrier to deploy frame relay

continued from page 35

vices besides plain old pipes," said Mike Viren, director of product development. "We settled on targeting LAN transport."

ICI's intrastate FTS offering will support LAN interconnection, enveloping of High-Level Data Link Control data in frame relay packets and alternate routing not available on regular private lines, Viren said.

Initially, FTS will be supported from three Cascade STDX switches — one each in Miami, Orlando, Fla., and here. Additional switches will be added in Jacksonville, St. Petersburg and Tallahassee, Fla., this summer, and more than 20 switches will be deployed by 1994.

ICI also plans to deploy Cascade gear in Atlanta so that it can link its frame relay service to those offered by long-haul carriers, several of which have major hubs in Atlanta, Viren said. ICI and WilTel officials have already had some discussions regarding interconnection, he said.

ICI's Cascade switches will be linked via T-1 lines from interexchange carriers in a mesh design. At least two T-1 lines will support each switch.

Each switch will support up to 96 64K bit/sec frame relay ports on the user side. ICI will sell frame relay ports in 64K bit/sec increments up to T-1 speeds and will recommend that users not order committed information rates — the minimum guaranteed throughput rate — any higher than the access port speed, Viren said.

ICI plans to charge a flat rate for the service. A typical frame relay circuit with a 64K bit/sec access port and three permanent virtual circuits (PVC) will cost about $130 per month. ICI will charge $55 for the circuit access, $45 for the aggregate bandwidth of the PVCs plus $20 for the first PVC and $5 for each additional PVC.

Viren said the company settled on Cascade's STDX after evaluating equipment from several suppliers. The price/performance of the STDX swung the decision. The switches cost from $16,000 to $42,000, compared to switches from more established vendors that can easily top $100,000, depending upon configuration.

Switches from StrataCom, Inc., Northern Telecom, Inc. and others proved "to be the wrong scale," Viren said. Those switches are better suited for interexchange carriers that have far fewer central offices in a given area and are better off consolidating large amounts of traffic on a big switch.

ICI's number of central offices in a given area usually falls somewhere between the interexchange carrier's few and the local exchange carrier's many, Viren said.

Buying big frame relay switches for all of ICI's central offices wouldn't have made sense economically, he added. Given the lower price and acceptable performance of the Cascade switches, ICI will be able to deploy several of them in each of the major cities it serves, thus shortening the distance of the access circuit users need to buy to get into the frame relay net.

While converted X.25 packet switches were a possibility for ICI's frame relay net, they didn't offer enough power to support ICI's planned service and the prices weren't any lower than those of the STDXs, Viren added.

Before settling on the Cascade gear, ICI almost decided to go with a router-based net, he said. But it was decided that such a network would have been a management nightmare and would have underutilized the routers' capabilities as well. **Z**

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Start-up secures funds, plots future

continued from page 35

what we do complements what Apple is up to," said Pike, who declined to detail how the firms are working together.
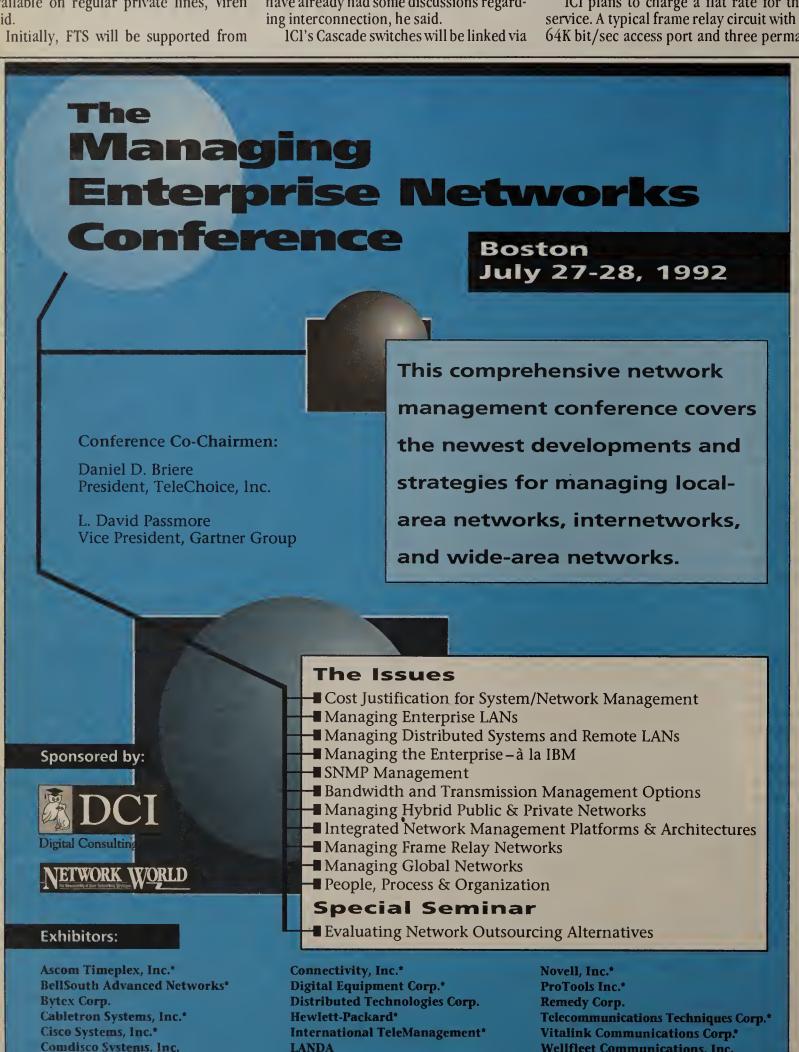
Pike acknowledged that the overall modem market is stagnant, but he emphasized that Global Village is not only in a hot segment of the modem market, but is more of a software than hardware company. Eleven of the company's 12 engineers are software developers, he said.

Although Global Village has become the early leader in the PowerBook connectivity market, competitors are expected to enter the arena soon, Pike said. The company's plans for the future include increasing the performance of its modems to support the emerging V.fast standard, beefing up the software-based features of the modems and targeting other computer platforms, which Pike declined to name.

According to Paul Zagaeski, a senior analyst at The Yankee Group, a market research firm in Boston, Global Village is well positioned.

"The company made a name for itself by designing easy-to-use modems with bulletproof software," he said. "The key will be to continue to find ways to add value to its products as more companies enter the market." **Z**

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Oracle V. 7 fuels dist. applications

continued from page 31

"People want to get at data across the network. Oracle is now handling the plumbing issues to move the data around; it provides users with a capability they didn't have before. I expect more people will buy into Oracle's solution; this is a big announcement," said Paul Cubbage, director of Unix and open systems research at Dataquest, Inc. in San Jose.

Analysts said Oracle has eased the development burden on companies by implementing new features such as a two-phase commit that require less programming than other database systems.

In addition, other new features — such as a global naming service, due out in a few months, and an industry-standard implementation of SQL — will help users in the implementation and management of distributed databases on enterprise networks.

"One of the great things about Oracle's approach is that they're hiding the differences between all the machines out on the network," said Bill Gates, chairman and chief executive officer of Microsoft Corp.

It has taken Oracle three years to deliver on the promise of Version 7, and the company certainly is not alone in moving the industry toward the use of distributed applications. Other database vendors such as Sybase, Inc. and Gupta Technologies, Inc. have pushed the distributed technology envelope.

But analysts said a growing number of users will take a hard look at the feasibility of deploying distributed databases because of Oracle's stature in the industry and the size and number of its customers.

"It's a major turning point in terms of distributed applications. As the industry leader, Oracle is forcing the industry to mature," said Neal Hill, senior analyst covering software with Forrester Research, Inc. in Cambridge, Mass. "Oracle is moving away from stressing the technical issues and making it more of a business case, showing benefits like less programming for users."

But even with Oracle's influence, the move to distributed applications will take time.

Users will need to examine how distributed database technology will affect their choices in wide-area services, local-area networks, operating systems and data access tools. For example, new technologies such as frame relay will be closely evaluated to determine how effective they will be in supporting distributed applications.

"In distributed environments, users are faced with making decisions that they didn't have to make before — especially in terms of optimization, performance and manageability," added Seybold's Rymer. "These issues are way beyond where users are today. It will take time." **Z**

IBI to port EDA/SQL to Unix servers

continued from page 31

cate with EDA/SQL Server software, which manages the flow of information between client programs and target databases or nonrelational files. It translates and passes client requests to other EDA/SQL Servers on remote processors or directly to target databases or file repositories and returns the requested data directly to the client workstation.

The server portion of EDA/SQL currently runs on IBM MVS, VM, OS/2 and RISC System/6000, Digital Equipment
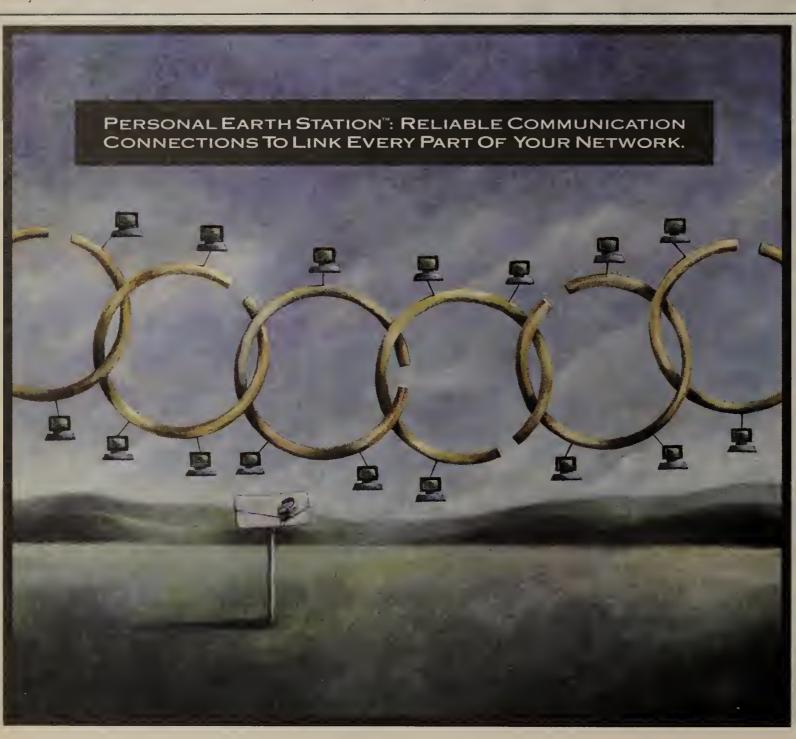
> The client portion of EDA/SQL works with applications from 27 independent software vendors.

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Corp. VAX and Hewlett-Packard Co. MPE operating systems.

The client portion of EDA/SQL works with applications from 27 independent software vendors, including Lotus Development Corp. and Microsoft Corp.

EDA/SQL currently has data drivers that enable the software to access data from more than 50 relational and nonrelational data repositories. Relational databases supported include those from Sybase, Inc., Oracle Corp., Informix Software, Inc., as well as IBM's DB2. Nonrelational file structures include Indexed Sequential Access Method (ISAM), C-ISAM, IMS/DB, ISAM and Model 204.

The EDA/SQL Server for Pyramid multiprocessors will cost from $24,000 to $118,500. Data drivers for each database or file structure that users wish to access will cost $4,394 per driver. **Z**

MANAGEMENT STRATEGIES

Worth Noting

"**M**igrating to open systems will enable us to concentrate on business problems rather than technology."

Paul Watz
Director of information technology
Computer Group
General Systems Sector
Motorola, Inc.
Tempe, Ariz.

Manager Minutes

NETLAN, Inc., a network and systems reseller, has announced a series of courses on NetWare and Unix systems at its recently opened technology center in New York. NETLAN offers courses that can qualify students for the Certified NetWare Engineer and The Santa Cruz Operation, Inc. Advanced Certified Engineer designations.
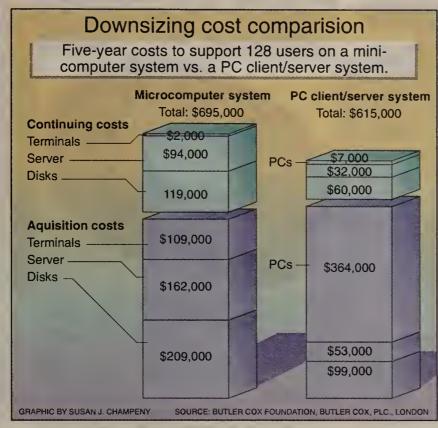
Courses range from $695 to $1,690 and are offered on a periodic basis in New York, Orlando, Fla. and Bensalem, Pa.

NETLAN also offers free vendor-sponsored, half-day seminars on network topics such as bridges and routers, superservers and asynchronous communications.

For more information, call (212) 768-2273.

A group of 21 **Sequoia Systems, Inc.** customers recently formed a user group to share ideas and provide feedback to the company about ways it can improve its products, technology, applications and service. Sequoia builds Unix-based, fault-tolerant, on-line transaction processing systems.

For more information, the Sequoia User Group can be reached at P.O. Box 876, Marlborough, Mass. 01752. **Z**

Downsizing cost comparision

Five-year costs to support 128 users on a mini-computer system vs. a PC client/server system.

Microcomputer system	PC client/server system
Total: $695,000	Total: $615,000

Continuing costs

Microcomputer system		PC client/server system	
Terminals	$2,000	PCs	$7,000
Server	$94,000		$32,000
Disks			$60,000
	119,000		

Aquisition costs

Microcomputer system		PC client/server system	
Terminals	$109,000	PCs	$364,000
Server	$162,000		
Disks			
	$209,000		$53,000
			$99,000

GRAPHIC BY SUSAN J. CHAMPENY   SOURCE: BUTLER COX FOUNDATION, BUTLER COX, PLC., LONDON

Hidden costs may come with downsizing savings

Firms should consider training, storage expenses.

By Wayne Eckerson
Senior Editor

LONDON — Companies that downsize mainframe applications can expect to save as much as 30% in systems costs over a five-year period. But downsizing also has inherent risks and hidden costs that network and systems managers need to consider before launching a downsizing effort.

That's according to "Downsizing Computer Systems," a study by the Butler Cox Foundation, an information systems (IS) research organization based here. The foundation is part of CSC/Index, Inc., an international consulting group specializing in information technology.

The report says companies that downsize from mainframes to minicomputers can save from 10% to 25% in network and computing costs. Downsizing from minicomputers to personal computer nets can save another 5% to 10% in systems costs.

For example, equipment for a minicomputer system supporting 128 users over five years costs $695,000. But a PC client/server system supporting the same number of users costs only $615,000 over five years (see graphic, this page). Moreover, most companies already have an installed base of PCs, making it even more financially attractive to migrate to client/server computing, according to the report.

PC platforms also support graphical user interfaces, which make applications easier to use and end users more productive. In addition, users that migrate to a PC client/server platform typically move from proprietary to open systems, which give companies greater flexibility to adapt applications to changing business requirements.

The report cautions that companies considering downsizing should weigh the potential risks and obstacles.

"The difficulty of assessing the costs of owning and operating downsized systems is that many of the costs are dispersed into the user community and can easily be hidden, making downsized systems seem cheaper than they really are," the report states.

Indirect expenses include the cost of the transition from host-to PC-based systems, server storage costs, end-user training and support costs. Also, the lack of adequate tools for applications development, support, design and testing, and systems maintenance can be significant obstacles to any downsizing effort.

In the first two to five years, most of the 30% cost savings will be chewed up in migrating from host-based to PC client/server systems, according to the report. Transition costs include support-

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BY DAVID FERRIS

Windows NT promises to ease net integration

Today's PC networks have too many operating systems. Each requires special knowledge to install, support and use. Getting them to work together takes even more specialized experience.

Microsoft Corp.'s Windows NT, due later this year, promises to clear up the mess. If Windows NT works well and is delivered on schedule, it will greatly reduce the tasks of network integration.

The main technical advantages of Windows NT are:

■ Preemptive multitasking so many programs can run at the same time. Bye-bye to kludgey terminate-and-stay-resident (TSR) programs.

■ Programs can be up to 4G bytes in size. No more squeezing into 640K bytes or tinkering with expanded memory.

■ Virtual memory. While running, a program doesn't physically have to be in random-access memory; large chunks can be swapped in and out of disk storage as necessary. Only the bits actually being executed have to be in RAM. So for example, you can have 200M bytes worth of programs running in 15M bytes of physical RAM. Bye-bye to RAM cram.

■ Memory protection for each process. When a program goes haywire, the damage is unlikely to spread to other applications or the operating system. This makes debugging a lot easier and greatly lessens the chance that a bug will bring the entire system down.

■ Symmetric multiprocessor support. If the host personal computer has several processors, Windows NT can allocate tasks to available processors.

■ Security. Users, passwords, and resource access permissions are added. For example, you can limit access to your PC's files and printers.

NT is an improved version of Windows that will be attractive to many independent software vendors (ISV). With relatively little extra effort, these vendors can write NT applications that will also run on Windows 3.X workstations. In addition, Microsoft claims that applications written for OS/2 will eventually run on Windows NT, many without recompilation.
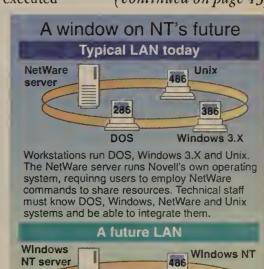
NT is designed to work on 80486 workstations with at least 12M bytes of RAM. As such, it will be used for high-powered workstations and servers. It's a natural for servers that require a multitasking OS to service multiple requests simultaneously.

Microsoft plans to ship LAN Manager For Windows NT at the same time it rolls out Windows

A window on NT's future

Typical LAN today

NetWare server — 486 Unix
286 386
DOS   Windows 3.X

Workstations run DOS, Windows 3.X and Unix. The NetWare server runs Novell's own operating system, requiring users to employ NetWare commands to share resources. Technical staff must know DOS, Windows, NetWare and Unix systems and be able to integrate them.

A future LAN

Windows NT server — 486 Windows NT
286 386
DOS   Windows 3.X

The advent of Windows NT will provide a consistent architecture across a LAN, making installation and support easier. With little extra effort, independent software vendors will be able to write NT applications that will also run on Windows 3.X workstations.

SOURCE: FERRIS NETWORKS, SAN FRANCISCO
GRAPHIC BY SUSAN J. CHAMPENY

Windows NT to ease net integration

NT. This means that LAN Manager networks will no longer need OS/2 and servers can run NT.

In the future, if NT gets significant market share, you can expect other network operating systems, such as Novell, Inc. NetWare and Banyan Systems, Inc. VINES, to run under NT.

NT in servers is an exciting development. According to Mike Wehrs, software product manager for NT beta site Maynard Electronics, Inc. in Lake Mary, Fla., users will employ the same commands to manage local and remote resources; for example, using the same utilities to examine local and remote print queues or to connect to different directories.

Technical support staff familiar with Windows 3.X will find it easy to install and maintain NT; most of the concepts and utilities are the same.

ISVs will use the same compilers, debuggers and other development tools to write both workstation and server code.

Windows NT may sound great in theory, but will it succeed in practice? There are a number of major factors to consider.

■ Timing. NT might be very late. Early versions might be unreliable and lack important functionality. OS/2 applications might not work well under NT, delaying the availability of applications software.

■ NetWare Loadable Modules (NLM). Currently, it is hard to write reliable applications that run inside NetWare servers because there's no memory protection or preemptive scheduling, and the choice of development tools is extremely limited.

Nevertheless, ISVs are persevering. One way or another, the NLM environment might become a lot more programmer-friendly, which could lessen the attractiveness of Windows NT.

■ OS/2. Most of today's development efforts by ISVs are going into Windows, not OS/2 and Presentation Manager. But suppose NT is inadequate, and OS/2 is accepted as a good multitasking OS. Suppose also that it's easy to convert Windows 3.X software to run under OS/2. (Although today, this assumption appears false.) The PC industry might then conceivably adopt it.

■ Transmission Control Protocol/Internet Protocol. Suppose TCP/IP really takes off over the next two years, so that about 50% of PCs use it. This would bring a lot of Unix know-how to PC support staff. Unix might then become the standard multitasking OS for PCs.

It's always tough to predict the future, but there's a good chance that Windows NT will rapidly evolve to become users' operating system of choice for networked computers. This assumes that the NT software development kit becomes available in mid-1992 and NT appears late this year or by mid-1993. It also assumes that the mass of ISVs currently writing for Windows 3.X will start writing for NT, and by 1994, most new workstations run NT. ◪

Ferris is the president of San Francisco-based Ferris Networks, which offers research reports, conferences, seminars and consulting on PC networking.

Costs may come with downsizing savings

ing two sets of hardware and software, as well as additional network equipment and lines, and increased end-user training.

Companies that migrate to a multisite client/server platform will incur more costs than single-site implementations. This is because a multisite architecture requires a more substantial network infrastructure, additional staff and more thorough end-user training.

Client/server platforms typically offer less server storage than mainframes or minicomputers, making some applications inappropriate on downsized platforms.

Another liability of client/server platforms is that systems management tools and procedures are still ill-defined compared to mainframe or minicomputer systems. This means users will have to develop their own systems management tools and procedures, which is often a time-consuming and laborious process.

Companies also will have to decide how to share responsibilities for managing client/server systems among the central IS group and local groups. This often leads to a politically charged debate not made any easier by the rapid convergence of LAN- and wide-area network-based net management technologies.

PC users require more support than terminal users because they have more software at their disposal, the report states. End users need additional training to make sure they perform regular backups, follow password procedures, adhere to software licenses and manage disk space and software distribution tasks properly. ◪

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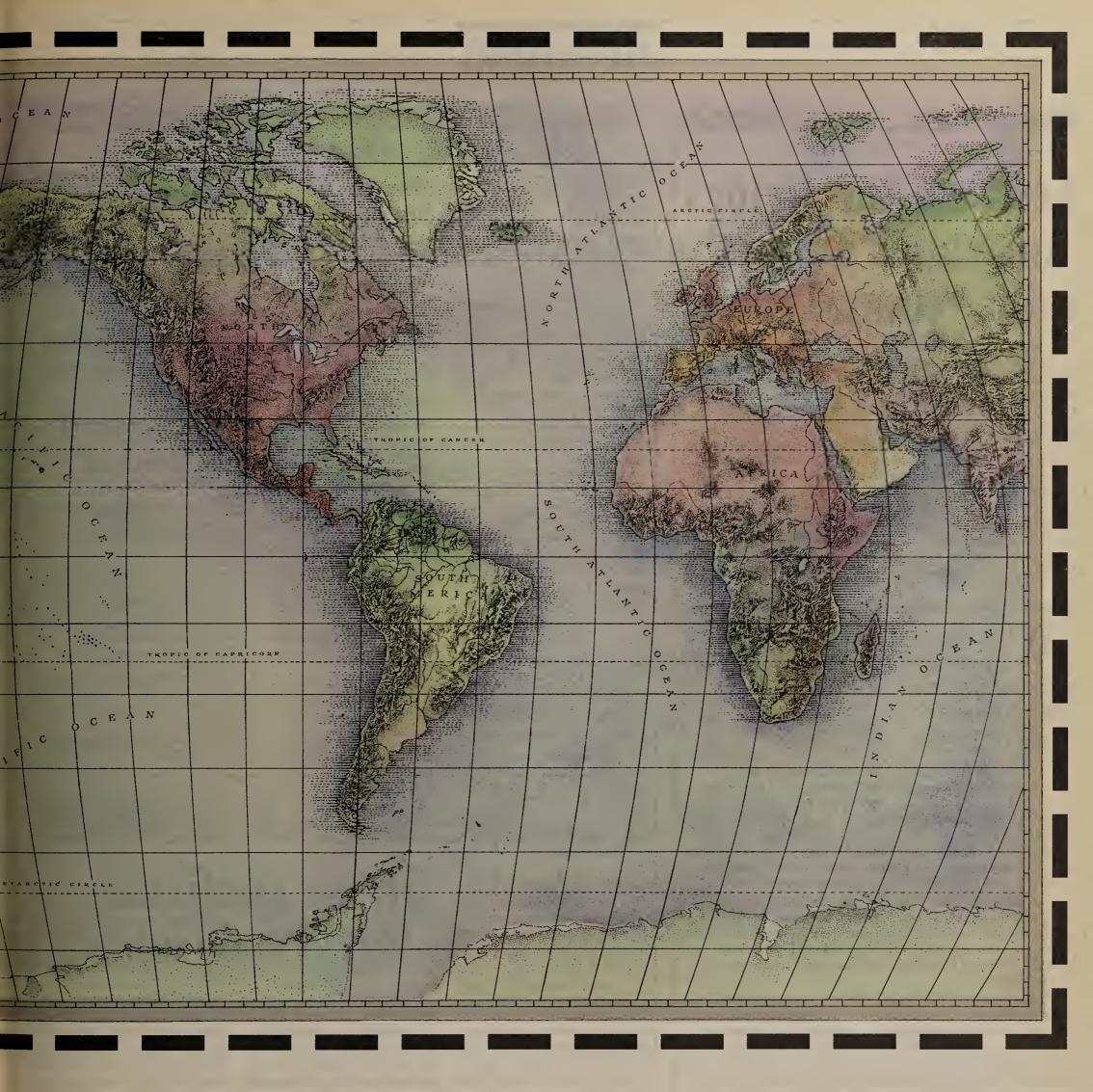
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Let's cut the strings on state 'puppet' utility commissions

Users need to push for change in the state regulatory process, which currently hampers their efforts to apply strategic communications technologies. Sometimes, ineffective state regulatory bodies, self-serving lobbyists and other special interest groups obstruct the introduction of competitive technologies.

In fact, in many cases, state public utility commissions (PUC) do not serve the needs of users or ensure the quality of service. They promulgate rules that protect the local exchange carriers against competition and fail to understand the evolution of technology. Thus, they prevent competition that would benefit users, and they impede the progress of new products and network services.

To understand the problem, everyone should know how the regulatory process affects the introduction of new technology.

> W**e need more technologists, not more lawyers or political hacks.**
> ▲▲▲

After someone invents and successfully tests a new way of transmitting data or comes up with some other important service capability, it's time to gain regulatory approval. At this stage, the members of most state PUCs finally get around to trying to understand the technology. These regulators are usually lawyers, campaign contributors who have been rewarded with a job or career politicians between jobs who are trying to carve out a new space at the public trough. Unfortunately, if state PUCs' task is to look through the "window" of technology and approve services that will enhance business and society, they appear to have the shades drawn.

Many utility companies, including local exchange carriers, would rather deal with political appointees that can be easily educated to their way of thinking than sharp, knowledgeable experts who can ask tough questions. "PUC" should stand for puppet utility commission because so many of them dance around on the end of a string held and controlled by local exchange carriers.

We need more technologists, not more lawyers or political hacks sitting on PUCs. Balancing the PUCs by appointing real technologists would help everyone, including local exchange carriers, who would benefit from having PUCs that quickly comprehend the technology and don't need six months to understand how a proposed service works. Technologists would also push local exchange carriers to roll out the advanced services desired by users. And they would be less prone to being swayed by local exchange carriers.

When you're sick, do you go to your accountant? When your car needs new brakes, do you go to your lawyer? No, you go to the person with the appropriate expertise. We have to get the people with the right background onto state PUCs to regulate local exchange carriers' service offerings. Otherwise, the market will still be driven by local exchange carriers that put a new spin on the old wine commercial and claim, "We will sell no technology before we think it's time." ∎

Carlini is president of Carlini & Associates, Inc., a management consulting firm in Hinsdale, Ill. He also lectures on information technology at Northwestern University in Evanston, Ill.

EDITORIAL

Reader praise confirms Network World's mission

Napoleon once quipped that an army marches on its stomach. But in the trade press, a publication marches on the strength of its readers.

We're pleased to have been honored in two major readership surveys by members of two prestigious organizations — the International Communications Association (ICA) and the INTEROP trade show.

In the ICA study, *The Wall Street Journal* queried members of the organization on spending and other issues. *Network World* came out on top by a wide margin as the most important and useful trade publication.

Since this is the third consecutive time the ICA has bestowed this honor on *Network World,* we consider it a ringing endorsement of our charter — that is, to be the most valuable source of information for professionals who design, build and manage corporate, government and university networks.

Likewise, the attendees at INTEROP named *Network World* over 120 other publications as the one they read regularly and the one that provides the best information on internetworking.

Coming from the leading users of network computing for multivendor nets, the honor underscores our mission to cover the strategic use of network technology from the user's perspective.

In addition to user recognition, *Network World* also recently walked away with *Magazine Week's* Editorial Excellence Award as the best publication in the network communications market.

To the ICA members and those who attended the IN-TEROP conference, we extend our appreciation for helping to validate our mission and for providing us with the feedback to ensure that *Network World* continues to march in step with its readers. ∎

OPINIONS

IBM appears to be losing its focus on SAA once again

Systems Application Architecture (SAA) received scant, if any, recognition when IBM announced its landmark networking blueprint last March. This was not only incongruous, but disturbing.

SAA was supposedly IBM's framework for cooperative processing, yet the company announced a networking strategy that appeared to be outside the SAA framework.

The network blueprint advocates that applications be able to freely use such network protocols as Transmission Control Protocol/Internet Protocol, Systems Network Architecture/Advanced Peer-to-Peer Networking and Open Systems Interconnection.

In following the blueprint, users will write applications using strategic application program interfaces (API), such as IBM's Common Programming Interface for Communications (CPI-C) and Unix remote procedure calls or sockets. In addition, they will use such services as SNA LU 6.2, OSI's Transaction Processing and the Open Software Foundation, Inc.'s Distributed Computing Environment. IBM will then make available to users a function that ensures these applications can run effectively across any appropriate network.

The focus of SAA, throughout its many twists and turns, has always been on the API and service-oriented application development environment IBM uses. In October 1987, IBM was talking about the possibility of using CPI-C across both SNA and OSI — a clear subset of the capability being proposed by the current blueprint. CPI-C was then included in SAA and is now a key part of the blueprint.

So why did IBM sideline SAA vis-a-vis the blueprint rather than highlighting the blueprint

as another positive manifestation of a sound SAA precept?

A realistic possibility is that IBM did not want to tarnish the blueprint by associating it with SAA, which has had a checkered history to date. SAA's credibility has suffered because of IBM's backpedaling on application portability.

Attempting to distance new strategies from SAA could be counterproductive for IBM because it sends mixed signals to users. SAA is now supposed to be the master plan for the new

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Enhancing the reputation of SAA should be a fairly high priority for IBM.

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computing model that revolves around workstations, cooperative processing, dispersed databases and total system management. Positioning new key strategies, such as the blueprint, outside the SAA framework undermines the credibility and significance of SAA, reducing it to a paper tiger "marketecture" — an architecture that is more of a marketing tool than a basis for real products.

If IBM could not make a go of SAA, its most ballyhooed strategy, what hope is there for ancillary strategies such as the blueprint or SystemView, which is deemed to be nothing but an SAA strategy. And that's the rub.

SAA is now the specter against which all other IBM strategies, blueprints and frameworks will be viewed and evaluated. For a long time to come, one of the first questions

that will be asked of any new IBM initiative will be, "Is this yet another SAA?" The blueprint, for all its potential promise, is already saddled with this baggage. Is it for real or will IBM forget about it also?

Viewed in this light, it would appear that enhancing the reputation of SAA should be a fairly high priority for IBM. Thus, the current deemphasis of SAA is ironic to say the least. What makes this even more difficult to comprehend is that SAA was riding the crest of an impressive wave of recognition at the end of last year.

Forty percent of IBM's product announcement extravaganza last September revolved around SAA. CPI-C is also now available on all key IBM computing platforms and is due to be available even on AIX early next year. Distributed Relational Database Architecture, the basis for SAA's concept of widely dispersed databases, is gaining ground.

All in all, SAA, which I once dubbed the "Hubble Telescope of the computer industry," appeared to have regained its focus toward the end of last year. But now it appears to have faded from the scene again.

Let's hope this is but a temporary aberration, and, as with the Hubble, attempts are being made to patch it up and make it work. There is too much riding on SAA's success. This is not the time to let the big picture go blurry on us once again. ▨

Guruge is lead consultant in BBN Communications Consulting Group in Cambridge, Mass. He is the author of several SNA books, including SNA Theory and Practice, *published by Pergamon Infotech, Ltd. in Maidenhead, England. He can be contacted by phone at (603) 878-1303 or via MCI Mail at AGuruge.*

The Future of Networking
January 16, 1993

Major network software manufacturers step up their anti-piracy campaigns against copyright infringers.

Business aside, I was kind of hoping they'd respond to our last warning letter.

Phil Frank

LETTERS

Not headhunters

Eric Schmall's recent article "Hunting for a qualified headhunter," (*NW,* June 8) unwittingly demeaned professional search firms. It's inappropriate to refer to all search firms as headhunters. But the article refers to search firms as "headhunters" ten times.

The author must have either had an unhappy experience with what sounds more like a "body shop."

The author asks, "Why can't these personnel professionals do a better job?" He's answered his own question: his guy was no pro.

Truly professional retained management search firms are exactly that — professional.

They're not skilled network managers, any more than they are skilled vice-presidents of engineering, marketing or any of the abilities for which they've been retained.

However, they are trained, experienced, professional identifiers, interviewers and qualifiers of executive talents. And they're paid well for the use of their expertise.

Their ethics are the highest in the business world because they are the confidants of business executives. They are, most emphatically, not headhunters.

Tim Maguire
President
T.H. Maguire & Associates, Inc.
Fairfield, Conn.

BUYER'S GUIDE

T-CARRIER MULTIPLEXERS

Becoming a jack of all nets

By BRUCE GUPTILL

Today's trend toward the hybridization of private networks — the mixing of public network services with private backbones — is forcing multiplexer vendors back to the drawing board to design additional features into their products.

To stay competitive and offer the features users need to build hybrid networks, mux vendors are adding new interfaces that increase the number of carrier services their products support. In addition, vendors are building more flexibility into their products via software and hardware upgrades.

Multiplexers are now being outfitted with such features as remote local-area network bridging and frame relay interfaces. Many are also now supporting inverse multiplexing, which spreads a high-speed data stream across multiple lower speed dedicated or switched circuits.

In addition, T-carrier multiplexer vendors have an eye toward adding interfaces for Switched Multimegabit Data Service (SMDS). Some are planning to upgrade their products to support Asynchronous Transfer Mode (ATM) switching.

A number of factors are driving this shift toward network hybridization and mux vendors' reaction to it. For instance, the cost of T-1 circuits is finally stabilizing and, in some cases, increasing after several years of a downward

CHART · GUIDE

Buyer's Guide charts on T-carrier multiplexers and their features and options begin on pages 52 and 58. A chart comparing muxes with LAN bridging capabilities begins on page 60.

spiral. This phenomenon makes private networking somewhat less attractive to users.

User interest in switched digital services such as AT&T's Accunet family of switched digital services is piquing. Most interexchange carriers now offer 56K/64K bit/sec switched data service for the price of a voice call, and some even offer switched T-1 service. As a result, a growing number of T-carrier mux makers are building switched service interfaces into their products.

Currently, most users are utilizing switched digital services as a backup for their T-1 leased lines. For example, Columbia Gas System, Inc. of Wilmington, Del., has connections from its Ascom Timeplex, Inc. Link/2+ multiplexers to AT&T Accunet Reserved switched digital service in case its dedicated T-1 lines go down. Columbia Gas primarily

New interface options help to expand role of T-carrier multiplexers beyond the world of private networks and into emerging hybrid nets.

uses its Link/2+ muxes to anchor its dedicated T-1 network.

"We haven't used switched 56 or other [switched] services yet, although it's a real possibility down the road, especially for videoconferencing," says George Wright, supervisor of system telecommunications operations for Columbia Gas System Service Corp., the computer and communications subsidiary that provides computer and communications services for Columbia Gas.

T-carrier mux vendors also realize switched voice service costs have dropped so low that users are migrating voice traffic off private networks and onto virtual private networks or to other switched services. As a result, mux vendors are more heavily promoting voice compression. Some vendors, such as Micom Communications Corp., compress voice digitized at the industry-standard rate of 64K bit/sec down to 4.8K bit/sec.

For the most part, products in the high end of the market are more likely to support these new interfaces and capabilities (see "Range of wares fills T-carrier mux mart," this page).

Architectural issues

The mix of interfaces any multiplexer can support is highly dependent on its bus architecture. Sophisticated and expensive multiplexers have buses designed to pass information between card slots. Using operating software, these devices examine addressing information in data received from a sending device and route the data across the bus to the appropriate outgoing port.

For example, data from a local personal computer network in Boston can be passed across the bus to the interface for a T-1 link to Houston one minute and to the interface for a T-1 link to New York the next minute.

The specific design, number of processors and software the bus uses vary widely by vendor. But for the most part, high-end devices have more powerful central processor boards and operating software that control the bus than do lower end products. They also support add-on boards with integral processors and software that provide specific functionality as the users' needs dictate.

In addition, the bus determines the number of slots a multiplexer can support, the amount of data it can process and, therefore, the maximum number of T-1 or T-3 links it can have. A high-capacity bus like the one in Ascom Timeplex's TX 3/Super Hub can have a maximum of 720M bits riding across it each second, enough to enable it to support a maximum of 10 T-3s and 196 T-1s.

High-end devices such as Newbridge Networks, Inc.'s Mainstreet and Telco Systems Network Access Corp.'s Route-24 product families have advanced architectures and built-in processing that support powerful add-on boards and operating software, allowing them to grow from basic channel banks up to intelligent multiplexers.

The ability to support add-on boards with their own processors and software enables high-end units to be easily upgraded with new functionality. Units at the lower end of the market use bus architectures that are similar to their more advanced cousins' but are limited in capacity. Lower end units can also support advanced functions via add-on boards, but these boards too are more limited in power than the ones used in high-end devices.

Vendors also employ varying techniques for moving data across the bus. An increasing number of multiplexers today support a packet or fast packet switching bus. Packet buses quickly transfer data between boards by moving information in large packets instead of in bits or bytes.

While packet multiplexing is geared for data applications, some users view packet multiplexing as a good alternative to time-division multiplexing (TDM) for packetized voice traffic. Packet multiplexing can make very efficient use of bandwidth by filling empty time slots caused by the delays in voice conversations with more packets instead of letting them remain idle as TDM does.

However, packet multiplexing introduces a slight processing delay because data or voice must be packetized before it can be transmitted. This can cause a problem for some applications by throwing off synchronization between sending and receiving devices or by introducing the risk of lost packets.

In the future, some multiplexer vendors, such as Network Equipment Technologies, Inc.'s (NET) Adaptive Corp. subsidiary, will be equipping products with an ATM bus that can shuttle data between ports at significantly higher rates than is possible today. These ATM buses will support access to ever speedier network services such as SMDS or Synchronous Optical Network (SONET)-based services.

Older and more established multiplexers have buses that use bit or byte interleaving to move data between boards. Bit interleaving inserts data into time slots on the bus a bit at a time, while byte interleaving inserts bytes of data into time slots. Bit- and byte-interleaved multiplexing techniques offer minimal delay in processing digitized voice or data when compared to packet multiplexing.

Vendors such as Netrix Corp. and Newbridge include both a bit- or byte-interleaved and a packet multiplexing capability in the same product. Others, such as Republic Telcom, give users the option of using only byte-interleaved TDM or packetized voice or using both simultaneously.

T-3 support

Today, not many vendors supply a bus capable of handling the amount of traffic required to interface with a T-3 link. But this may change as T-3 networking catches on. T-3 services are now becoming available in more areas and users are finding ways to fill up the 45M bit/sec of bandwidth T-3 provides.

Most T-3 services in use today support point-to-point links in backbone networks. There simply is not much need for multipoint T-3 links yet.

Currently, T-3 is supported by specialized high-end multiplexers with high-speed buses such as Ascom Timeplex's TX 3/Super Hub and Granger-Telettra's DTM 45 and DTI 4. But at least two products — NET's IDNX/90 and Newbridge's 3645 Mainstreet — are designed to handle T-3 and T-1 circuits equally well. General DataComm, Inc.'s (GDC) Transport Management System (TMS) multiplexer series includes a SONET/T-3 model, but it is not built on the same bus architecture as its T-1 TMS products.

T-carrier multiplexer vendors are spending more time and money building frame relay interfaces that will enable their products to interconnect LANs in remote offices.

Frame relay

While it may not yet be widely used, frame relay has indeed arrived. More than 20 T-carrier multiplexers offer a frame relay interface. And while most of those products fall into the high end of the market, even some low-end devices are sporting a frame relay interface. Digital Link Corp., for example, offers frame relay in its DL551VX multiplexing data service unit/channel service unit (DSU/CSU).

Frame relay support is added to existing TDMs through add-on packet switching processors. Working with the CPU and operating software, these add-ons route frame relay traffic over circuit-switched links. This forces users to allocate channels on T-1 or T-3 links to frame relay traffic, thus limiting the amount of frame relay traffic that can be transmitted at any given time.

T-carrier muxes supporting integral packet processing such as StrataCom, Inc.'s IPX Fast-Packet Networking Switch are able to dynamically assign bandwidth, which makes it possible for the amount of frame relay traffic flowing across links to fluctuate. Dynamic bandwidth allocation assigns bandwidth at the time data must be transmitted.

One important note about frame relay: While standards exist, vendor implementations differ. So make sure the frame relay interface you choose can interoperate with your carrier's network equipment as well as the equipment at the receiving end.

In addition to frame relay sup-

Range of wares fills T-carrier mux mart

Today's T-carrier multiplexer market is populated with a full range of products, from high-end intelligent devices — also known as resource managers — to data service unit/channel service units (DSU/CSU) with basic multiplexing features.

Intelligent muxes provide the high-capacity networking capabilities needed to anchor private backbone networks. Their intelligence comes from their architecture, which includes sophisticated processing technology and operational software. These units provide powerful bandwidth management features, including dynamic bandwidth allocation and alternate path routing, and network management features, such as local and remote diagnostics.

Most, if not all, of these high-end units made by vendors such as Ascom Timeplex, General DataComm, Inc., Network Equipment Technologies, Inc. and Newbridge Networks, Inc. can be easily expanded through add-on boards.

The units are built around a chassis that fits into a standard cabinet and comes equipped with high-speed backplane buses, typically capable of supporting multiple T-1 or T-3 circuits. The buses support a multitude of interface and processor boards designed to provide specific features such as voice compression, packet switching or even local-area network bridging.

In the mid-range of the market are intelligent multiplexers that support a limited number of boards and provide less processing power and fewer functions than the high-end devices. These mid-range products are typically used as feeder muxes, linking low-volume sites to the backbone. Motorola Codex often positions its 6250 multiplexer as a feeder mux, although it can be used as a backbone multiplexer just as well.

Feeder products typically support T-1 as well as fractional T-1 and 56K/64K bit/sec links. Some, such as Micom Communications Corp.'s Marathon 5K and Marathon 1K, are not typically thought of as T-carrier multiplexers, but they do provide connectivity to backbones in increments of 56K/64K bit/sec up to 1.536M bit/sec.

At the low end of the market are channel banks — one of the simplest forms of T-carrier multiplexer — and multiplexing DSU/CSUs. Channel banks lack processing power, usually lack voice compression, cannot provide programmable or dynamic allocation of circuits and do not offer much in the way of network management. Channel banks are commonly used to simply funnel multiple voice or data inputs into a T-1 line, a function that is being taken over by multiplexing DSU/CSUs. Just about every major mux vendor has a channel bank in its T-carrier multiplexer product family.

Multiplexing DSU/CSUs do not have many of the capabilities of other T-carrier multiplexers. They provide little more than a method of linking data terminal devices at low-volume sites to a T-1 or T-3 trunk that feeds into the backbone.

Unlike channel banks, these products support some measure of net management by monitoring the circuit for bipolar, ones-density and bit error violations.

Multiplexing is an add-on capability to traditional DSU/CSUs, which provide the interface between customer equipment and a carrier's digital transmission facility.

Vendors of high-end T-carrier multiplexers have been providing an integral DSU/CSU within their products to perform this function for some time. But only within the last few years have DSU/CSU vendors started offering multiplexing capabilities in their products.

To satisfy the growing needs of customers, several vendors offer products that can be upgraded from low-end devices to top-of-the-line models. For instance, many channel banks can be upgraded through combinations of add-on hardware and software to become full-fledged intelligent multiplexers.

— *Bruce Guptill*

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T-carrier multiplexers (continued on page 56)

Voice modulation legend: A = Adaptive differential pulse code modulation, CE = Code-excited linear predictive, CV = Continuous variable slope delta, P = Pulse code modulation, O = Other

Mux type legend: C = Channel bank, D = DSU/CSU, FT-1 = Fractional T-1

Company	Product	Mux type	Analog	DDS	Switched 56K/64K	DS0	FT-1	T-1	T-3	ISDN PRI	Frame relay	SMDS	Wide-area	Input	Minimum	Maximum	Maximum combined	Analog 2-wire	Analog 4-wire	Foreign exchange	G.732	E&M	D4	RS-232	V.35/RS-422	V.35/RS-422	Multiplexing technique	Voice modulation	Price
ADC Fibermux (818) 709-6000	Magnum 100	T-3							✔				1	256	1.2K	16M	45M							✔	✔	✔	Bit	NA	$7,000
ADC Kentrox (800) 733-5511	DataSmart	D			✔	✔				✔	✔		1	4	56K	1.536M	1.536M							✔	✔		Byte	NA	$2,995
Ascom Timeplex, Inc. (201) 930-4600	EntreeLink+	T-1		✔				✔					4	44	45.5	1.984M	10.75M	✔	✔	✔		✔	✔	✔	✔		Byte	P, O	$6,500
	TX 3/Super Hub	T-3						✔	✔				10 T-3, 196 T-1	10 T-3; 196 T-1	1.5M	45M	720M										Byte	NA	$30,000
	Link/2+	FT-1, T-1	✔	✔	✔	✔	✔	✔			✔		7	248	45.5	1.984M	10.75M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P, CV, O	$16,000+
	MiniLink/2+	FT-1, T-1	✔	✔	✔	✔	✔	✔			✔		7	248	45.5	1.984M	10.75M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P, CV, O	$12,500+
Astrocom Corp. (612) 227-8651	NX 6456	FT-1, T-1					✔	✔					1	5	56K	1.536M	1.536M						✔		✔	✔	Byte	NA	$4,500
AT&T Paradyne (800) 482-3333	Acculink 731	D			✔	✔							1	4	1.2K	1.536M	1.536M							✔	✔		Bit, byte	NA	$5,300
	Acculink 740	FT-1, T-1, C	✔	✔		✔		✔					1	128	300	1.536M	1.536M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Bit, byte	A, P	$10,000 - $46,000
	Acculink 742	FT-1, T-1, C	✔	✔		✔		✔					1	32	300	1.536M	1.536M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Bit, byte	A, P	$5,900 - $20,000
	Acculink 745	T-1				✔	✔	✔					16	384	1.536M	1.536M	1.536M X 16						✔				Bit, byte	P	$9,200 - $50,000
Bayly Communications, Inc. (416) 686-1011	Omniplexer	C, T-1	✔	✔		✔		✔					2	288	300	1.536M	1.536M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Bit	A, P	$3,000 - $8,000
Canoga-Perkins (818) 718-6300	3140 T-1 Multiplexer	C, FT-1, T-1	✔	✔		✔	✔	✔					2	240	300	1.92M	1.92M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	P	$5,000 - $50,000
CYLINK Corp. (408) 735-5800	4202 FT1 ACSU	D					✔	✔					1	2	56K	1.536M	1.536M						✔		✔	✔	Byte	NA	$3,450
	Network Integrator	FT-1					✔	✔					2	8	56K	1.536M	3.072M						✔		✔	✔	Byte	NA	$4,000 - $12,000
Digital Link Corp. (408) 745-6200	DL200 SMDS Converter	D										✔	1	1	1.17M	1.17M	1.17M								✔	✔	Fast packet	NA	$6,195
	DL551 VX DSU/CSU	D					✔	✔			✔		1	2	56K	1.544M	1.544M								✔	✔	Byte	P	$2,995
	DL100 Digital Service Multiplexer	D, FT-1					✔	✔			✔		1	6	56K	1.544M	1.544M								✔	✔	Byte	P	$3,695
	DL3200 Digital Service Interface	D, T-3							✔			✔	1	1	4M	34M	34M						✔				Bit	NA	$14,995
	DL3000 Digital Service Multiplexer	D							✔				4	256	56K	44.2M	44.2M							✔	✔	✔	Bit	NA	$15,000
	DL3100 Digital Service Multiplexer	D							✔				1	3	56K	44.2M	44.2M								✔	✔	Bit	NA	$11,495
Dowty Communications, Inc. (800) 227-3134	DCP3555	FT-1					✔	✔					1	2	56K	1.536M	1.544M							✔		✔	Byte	P	$3,175
	DCP4857	D, FT-1, T-1					✔	✔					1	8	56K	1.536M	1.544M							✔	✔	✔	Byte	P	$2,200+
	DCP9506, 9401	C, D, FT-1, T-1	✔	✔	✔	✔	✔	✔					1	60	300	1.536M	1.544M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P	$2,750+
	DCP9900, 9115	FT-1, T-1		✔	✔	✔	✔	✔					10	1,200	300	1.536M	1.544M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P	$4,000 - $15,000
DSC Communications Corp. (214) 519-3000	CP3000	FT-1, T-1	✔	✔	✔	✔	✔	✔					16	56	300	1.984M	73.728M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte, packet	A, P	$12,000 - $30,000
	CP4000	FT-1, T-1	✔	✔		✔	✔	✔					34	120	300	1.984M	73.728M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte, packet	A, P	$18,000 - $60,000
Gandalf Systems Corp. (609) 424-9400	Infotron 2000	C, FT-1, T-1	✔	✔	✔	✔	✔	✔		✔	✔	✔	99	12,000	50	1.984M	80M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte, fast packet	A, P, O	$50,000
	Infotron 2300	C, FT-1, T-1	✔	✔	✔	✔	✔	✔			✔	✔	20	4,000	50	1.984M	20M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P, O	$8,000
	Infotron 2120	C, FT-1, T-1	✔	✔	✔	✔	✔	✔			✔	✔	1	11	50	512K	2M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P, O	$2,120
General DataComm, Inc. (203) 574-1118	TMS	T-1	✔	✔	✔	✔	✔	✔		✔	✔		32	512	75	2M	45M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Bit, byte	A, P, CV, +	$8,900
	SONET TMS	SONET T-3					✔	✔	✔				2	336	1.544M	51.8M	622M						✔				Byte	NA	$30,000
Granger-Telettra (408) 944-9190	DTM 45	T-3							✔				1	28	1.544M	45M	45M										Byte	P	$7,000 - $23,000
	DTI 45	T-3				✔		✔	✔				2	14	64K	1.544M	45M		✔			✔					Byte	P	$7,000 - $30,000
Integrated Network Corp. (908) 218 - 1800	CM-ET1	FT-1, T-1, D, E-1				✔	✔	✔			✔		1	5	56K	2.048M	2.048M						✔		✔	✔	Byte	NA	$4,915

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But to be perfectly honest, not all development and testing takes place at our place.

Because the engineers at Novell, SCO, Microsoft and Banyan—

Unfortunately, those engineers were unable to make it to the above photo session.

Nor could the specialists who created the COMPAQ ToolKits and TechNotes—the industry's most sought-after

T-carrier multiplexers (continued on page 57)

Company	Product	Mux type (C = Channel bank, D = DSU/CSU, FT-1 = Fractional-T-1)	Analog	DDS	Switched 56K/64K	DS0	FT-1	T-1	T-3	ISDN PRI	Frame relay	SMDS	Wide-area	Input	Minimum	Maximum	Maximum combined	Analog 2-wire	Analog 4-wire	Foreign exchange	G.732	E&M	D4	RS-232	V.35/RS-422	V.35/RS-422	Multiplexing technique	Voice modulation (A = Adaptive differential pulse code modulation, CE = Code-excited linear predictive, CV = Continuous variable slope delta, P = Pulse code modulation, O = Other)	Price
Larse Corp. (408) 988-6600	Diversi-T 100 Inverse Multiplexer	D, FT-1			✔	✔	✔	✔		✔			2	2	56K	1.536M	1.536M						✔		✔	✔	Byte	NA	$5,500
	Diversi-T 1400 Inverse Multiplexer	D, FT-1			✔	✔	✔	✔		✔			2	22	56K	1.536M	1.536M						✔		✔	✔	Byte	NA	$5,900
	Mega-T Network Service Unit	D, T-1						✔					8	2	1.528M	12.224M	12.224M						✔		✔	✔	Bit	NA	$17,500 - $25,000
	Split-T Fractional T-1 Multiplexer	D, FT-1			✔	✔	✔			✔			1	3	56K	1.536M	1.544M						✔		✔	✔	Byte	NA	$3,400 - $4,395
	Access-T Network Access DSU/CSU	D, FT-1			✔	✔	✔			✔			1	5	56K	1.536M	1.544M						✔		✔	✔	Byte	NA	$2,845 - $5,650
	Access-T45 DS3 Network Service Unit	D, T-3							✔				1	2	3M	44.2M	44.2M										Byte	NA	$12,490
Micom Communications Corp. (800) 642-6687	Marathon 5K	FT-1	✔	✔		✔	✔						5	41	50	56K	1.536M	✔	✔		✔		✔	✔	✔		Fast packet	O	$2,750
	Marathon 1K	FT-1	✔	✔		✔	✔						1	41	50	56K	1.536M	✔	✔		✔		✔	✔	✔		Fast packet	O	$1,750
Motorola Codex (508) 261-4000	6250	FT-1, T-1		✔		✔	✔	✔					6	90	2.4K	768M	16M		✔	✔	✔	✔	✔				Byte	A, P	$8,000
Netrix Corp. (703) 742-6000	#1-ISS	FT-1, T-1	✔	✔	✔	✔	✔				✔		160+	6,000	110	2M	16M		✔	✔	✔	✔	✔	✔	✔		Bit, packet, frame relay	O	$15,000
Network Equipment Technologies, Inc. (415) 366-4400	ADNX/48	C, FT-1				✔	✔						2	48	2.4K	64K	1.544M	✔	✔		✔	✔	✔	✔	✔	✔	Byte	P	$3,500 - $18,000
	ADNX/60	FT-1	✔	✔	✔	✔							2	32	1.2K	64K	490K	✔			✔		✔	✔	✔	✔	Byte	O	$6,000
	IDNX/20	T-1	✔	✔	✔	✔	✔	✔					15	540	1.2K	1.344M	32M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P, O	$17,000 - $36,000
	IDNX/20-S	T-1	✔	✔	✔	✔	✔	✔					15	540	1.2K	1.536M	32M	✔	✔			✔	✔	✔	✔	✔	Byte	A, P, O	$16,000 - $31,000
	IDNX/70	T-1	✔	✔	✔	✔	✔	✔					96	768	1.2K	1.536M	32M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P, O	$62,000 - $217,000
	IDNX/90	T-1, T-3	✔	✔	✔	✔	✔	✔	✔				96	2,000	1.2K	2.048M	256M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P, O	$80,000 - $220,000
Network Equipment Technologies, Inc./Adaptive Corp. (415) 366-4400	STM/18	FT-3					✔	✔					18	504	1.5M	49M	1.2G										Byte	NA	$70,000
Newbridge Networks, Inc. (703) 834-3600	3600 Mainstreet	C, FT-1, T-1	✔	✔	✔	✔	✔	✔			✔		32	1,536	150	1.920M	64M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte, packet, frame relay	A, P, O	$10,000 - $60,000
	3606 Mainstreet Little Mux	FT-1	✔	✔			✔						1	12	150	64K	256K	✔	✔	✔		✔	✔	✔	✔	✔	Byte	A, P, O	$10,000 - $60,000
	3612 Mainstreet Narrowband Multiplexer	FT-1	✔	✔			✔						4	96	150	64K	1.536M	✔	✔	✔		✔	✔	✔	✔	✔	Byte	A, O	$2,500
	3624 Mainstreet Intelligent Channel Bank	C, FT-1	✔	✔	✔	✔	✔	✔					1	96	150	1.344M	1.536M	✔	✔	✔	✔			✔	✔	✔	Byte	P	$3,000 - $4,000
	3630 Mainstreet Primary Rate Multiplexer	C, FT-1	✔	✔	✔	✔	✔	✔					2	128	50	1.920M	1.920M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	P	$5,700
	3645 Mainstreet	C, FT-1, T-1, FT-3, T-3	✔	✔	✔	✔	✔	✔	✔		✔		256	12,288	150	1.920M	512M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte, packet, frame relay	A, P, O	$40,000 - $200,000
Northern Telecom, Inc. (404) 840-5000	DE-4E Smart	C	✔	✔	✔	✔	✔	✔					1	24	75	768K	1.536M	✔	✔	✔		✔	✔	✔	✔	✔	Byte	A, P	$8,000
Paragon Networks International, Inc. (203) 740-1800	PNP-800/8000 Series	D, FT-1, T-1, C	✔	✔		✔	✔	✔			✔		8	64	1.2K	1.920M	12.3 M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Bit, byte, packet, fast packet	A, P, CE	$5,500
Penril Datacom Networks (301) 921-8600	Series 1544	C, FT-1, T-1				✔	✔						2	24	75	768K	1.536M	✔	✔	✔		✔	✔	✔	✔	✔	Byte	P	$3,800 - $15,740
Primary Communications, Inc. (619) 458-5861	Metro-T	D, FT-1				✔	✔						2	4	56K	1.984M	3.968M			✔		✔			✔	✔	Byte	NA	$3,750
Pulse Communications, Inc. (800) 841-1005	T1 Business Bank	C, FT-1, T-1, T-1C, Optical	✔	✔	✔	✔	✔	✔		(1)	✔		2	480	75	1.536M	3.152M	✔	✔	✔	✔	✔	✔	✔	✔	✔	Byte	A, P	$3,110

T-carrier multiplexers

Company	Product	Mux type (C = Channel bank, D = DSU/CSU, FT-1 = Fractional T-1)	Network circuits: Analog	DDS	Switched 56K/64K	DS0	FT-1	T-1	T-3	ISDN PRI	Frame relay	SMDS	Max. # interfaces: Wide-area	Input	Input speed (bit/sec): Minimum	Maximum	Maximum combined	Network interfaces: Analog 2-wire	Analog 4-wire	Foreign exchange	G.732	E&M	D4	RS-232	V.35/RS-422	V.35/RS-422	Multiplexing technique	Voice modulation (A = Adaptive differential pulse code modulation, CE = Code-excited linear predictive, CV = Continuous variable slope delta, P = Pulse code modulation, O = Other)	Price
Racal-Datacom (800) 722-2555	Omnimux 800 TDM	D		✓	✓	✓							1	32	2K	38.4K	768K	✓	✓	✓		✓		✓	✓	✓	Bit	A, O	$2,700
	Omnimux 800 FT-1	D, FT-1, T-1	✓				✓	✓					1	4	56K	1.536M	71.536M						✓		✓	✓	Bit	NA	$4,500
	Omnimux 7000	C, D, FT-1, T-1	✓	✓	✓	✓	✓	✓					1	24	300	1.536M	1.536M	✓	✓	✓		✓		✓	✓	✓	Byte	P	$6,000 - $40,000
	Omnimux 8000	FT-1, T-1	✓	✓		✓	✓	✓					8	768	300	1.536M	1.536M		✓					✓	✓	✓	Bit	A, P, CV	$7,000
	Omnimux 9000	T-1	✓	✓		✓	✓	✓					36	24	300	1.536M	1.536M		✓	✓	✓	✓	✓	✓	✓	✓	Byte	A, P	$8,000
RAD Data Communications, Inc. (201) 529-1100	MP 2000 Series	FT-1, T-1	✓	✓		✓	✓	✓					2	100	1.2K	1.536M	3.072M	✓	✓	✓	✓	✓	✓	✓	✓	✓	Byte	A, P	$2,800+
Raycom Systems, Inc. (818) 909-4186	Model 5110	FT-1, T-1				✓	✓	✓					1	32	300	2.048M	28M			✓				✓	✓	✓	Bit	NA	$3,000 - $11,500
	FiberRing 100	FT-1, T-1				✓	✓	✓					1	32	300	2.048M	100M			✓				✓	✓	✓	Bit	NA	$3,000 - $11,500
Republic Telcom Systems Corp. (800) 822-6227	RLX-D Series Multiplexing System	FT-1, T-1											96+	96+	1.2K	2M	24M +			✓	✓	✓	✓	✓	✓	✓	Byte, packet	P, CE, O	$10,000 - $40,000
StrataCom, Inc. (408) 294-7600	IPX FastPacket Networking Switch	T-1	✓	✓		✓	✓	✓			✓	✓	96	200	300	1.344M	128M	✓	✓	✓	✓	✓	✓	✓	✓	✓	Fast packet	A, P	$10,000
Telco Systems Network Access Corp. (800) 776-8832	DCB-24	C, FT-1, T-1	✓	✓	✓	✓	✓	✓		(1)			1	96	1.2K	1.536M	1.536M	✓	✓	✓	✓	✓	✓	✓	✓	✓	Bit, byte	A, P	$4,000 - $15,000
	DDI-24	C, FT-1, T-1	✓	✓	✓	✓	✓	✓		(1)			1	96	1.2K	1.536M	1.536M	✓	✓	✓	✓	✓	✓	✓	✓	✓	Bit, byte	A, P	$1,400 - $10,000
	DCB-24DD	C, FT-1, T-1	✓	✓	✓	✓	✓	✓		(1)			1	96	1.2K	1.536M	1.536M	✓	✓	✓	✓	✓	✓	✓	✓	✓	Bit, byte	A, P	$3,400 - $15,000
	Route-24	C, FT-1, T-1	✓	✓	✓	✓	✓	✓		(1)			1	96	1.2K	1.536M	1.536M	✓	✓	✓	✓	✓	✓	✓	✓	✓	Bit, byte	A, P	$6,000 - $18,000
	Route-24DD	C, FT-1, T-1	✓	✓	✓	✓	✓	✓		(1)			1	96	1.2K	1.536M	1.536M	✓	✓	✓	✓	✓	✓	✓	✓	✓	Bit, byte	A, P	$3,495
Telematics International, Inc. (305) 772-3070	DX	FT-1, T-1	✓	✓		✓	✓	✓					8	508	50	2M	12.5M	✓	✓	✓		✓	✓	✓	✓	✓	Bit	A, P	$10,000 - $150,000
Tellabs, Inc. (708) 969-8800	Crossnet Bandwidth Management System	FT-1, T-1	✓	✓	✓	✓	✓	✓					16	128	300	1.984M	1.984M	✓	✓	✓	✓	✓	✓	✓	✓	✓	Bit, byte	A, P, low delay, CE	$3,500 - $30,000
T3plus Networking, Inc. (408) 727-4545	BMX 45 Bandwidth Manager	T-3					✓	✓					12	192	1.544M	44.21M	800M			✓				✓	✓	✓	Bit	NA	$42,000+
TxPORT (800) 926-0085	1564A	D, FT-1, T-1		✓		✓	✓	✓			✓		3	4	56K	1.536M	1.536M						✓		✓	✓	Byte	NA	$2,995
TyLink Corp. (508) 285-0033	ONS 400	D, FT-1, T-1		✓		✓	✓	✓					1	4	2.4K	1.536M	1.536M						✓		✓	✓	Byte	P	$2,995
	SNS 4000	D, FT-1, T-1, PRI	✓	✓	✓	✓	✓	✓		✓	✓		1	4	2.4K	1.536M	1.544M						✓		✓	✓	Byte	P	$7,995
Verilink Corp. (408) 945-1199	Access System 2000	D				✓	✓				✓		14	52	300K	1.536M	1.536M						✓		✓	✓	Byte	NA	$5,000

(1) Supports ISDN Basic Rate Interface only.

DDS = Digital Data Service
DSU/CSU = Data service unit/channel service unit
FR = Frame relay interface
NA = Not applicable

PRI = Primary Rate Interface
SMDS = Switched Multimegabit Data Service
SONET = Synchronous Optical Network
TMS = Transport Management System

SOURCE: TELECHOICE, INC., MONTCLAIR, N.J.

(continued from page 50) port for LAN interconnection, a few vendors are coming out with boards and software that add remote LAN bridging features to their T-carrier multiplexers. NET worked with IBM to go beyond LAN bridging and come up with the LAN/WAN Exchange board, which enables NET's IDNX to support LAN routing.

LAN bridging

Of course, users need not restrict themselves to using a built-in bridge to connect LANs via T-carrier or fractional T-carrier links. They can feed data from stand-alone bridges into a T-carrier mux.

Columbia Gas links its stand-alone IBM bridges to its Ascom Timeplex Link/2+ multiplexers to connect 4M and 16M bit/sec IBM Token-Ring LANs over the corporate backbone at speeds from 9.6K to 56K bit/sec.

Putnam Fiduciary Trust Co., a mutual funds operator in Boston, uses TyLink Corp. ONS 400 multiplexing DSU/CSUs to link its LANs over terrestrial and micro-wave T-1 circuits.

"We spent a lot less money doing it this way than we would have putting a new T-1 shelf [in our existing multiplexer], and it gets the job done," says Steven Cataldo, net manager for Putnam. His company uses the links to transfer data, including image files containing scanned mail, and trade orders for its mutual funds.

Users that would rather install LAN bridges in their T-carrier multiplexers need to understand how vendors describe throughput figures. Several vendors list their bridging bit rate as the top bit rate of the LAN. This is also known as the wireline rate. For example, GDC and other vendors list the bridging bit rate for their muxes as 10M bit/sec for Ethernet and 16M bit/sec for token-ring. In actuality, the bridging bit rate is limited to the bit rate or bandwidth available on the link from the LAN to the multiplexer or between the sending and receiving muxes.

The saving grace for users is that the actual throughput of a LAN seldom matches its rated speed. And with the various multiplexing and data compression techniques used today, most users will notice very little decline in LAN response time when bridging via T-carrier muxes.

Inverse multiplexing

Another new technology that aids in LAN interconnection is inverse multiplexing, and a number of T-carrier multiplexer vendors have added support for it to their products. Almost unheard of until 1988, inverse multiplexing has (continued on page 59)

T-carrier multiplexer features and options (continued on page 59)

Company	Product	Features																Diagnostics				Display			Net mgmt. supported		
		Inverse mux support	Tandem switching support	Manual route selection	Automatic route selection	Time-of-day route selection	Downline loading	Upline loading	Redundant power	Password security	Channel prioritization	Subrate data muxing	Subrate voice muxing	Dynamic bandwidth allocation	Supervisory/net mgmt. port	ESF monitoring	Software configurable	Local/remote loop-back testing	Self-testing	Bit error rate testing	Alarm displays	LED	Front-panel display	External display terminal	IBM's NetView	AT&T's Accumaster Integrator	Proprietary
ADC Fibermux, (818) 709-6000	Magnum 100								O	O					O			O			O			O			O
ADC Kentrox, (800) 733-5511	DataSmart						S		S									S	S	S	S	S		S			S
Ascom Timeplex, Inc., (201) 930-4600	EntreeLink+			S	S	O	S			S	S				S			S	S	S	S	S	S	S			S
	TX 3/Super Hub	O	S	S	O	S			O	S	S			S	S	S	S	S	S	S	S	S	S	S	O	O	S
	Link/2+	O		S	S	O	O	O	O	O	S	S	O		S	S	S	S	S	S	S	S	S	S	O	O	S
	MiniLink/2+	O		S	S	O	O	O	O		S	O			S	S	S	S	S	S	S	S	S	S	O	O	
Astrocom Corp., (612) 227-8651	NX 6456				O		S		O	S					S	S	S	S	S		S	S	S	S			(1)
AT&T Paradyne, (800) 482-3333	Acculink 731			S	S	S	S		S	S					S	S	S	S	S	S	S	S	S	S		O	O
	Acculink 740			S	S	S	S	O	S	S	S	S			S	S	S	S	S	S	S	S	S	S		O	O
	Acculink 742			S	S	S	S		S	S	S	S			S	S	S	S	S	S	S	S	S	S		O	O
	Acculink 745			S	S	S	S	O	S	S	S	S			S	S	S	S	S	S	S	S	S	S		O	O
Bayly Communications, Inc., (416) 686-1011	Omniplexer												O	O				S									
Canoga-Perkins, (818) 718-6300	3140 T-1 Multiplexer			S	S	O	O		O	S		S			S	S	S	S	S	S	S	S		S			O
CYLINK Corp., (408) 735-5800	4202 FT-1 ACSU			S	S										S	S	S	S	S	S	S	S	S				O
	Network Integrator			S	S	O	S								S	S	S	S	S	S	S	S	S	S			O
Digital Link Corp., (408) 745-6200	DL200 SMDS Converter														S	S	S	S	S	S	S	S	S	S			
	DL551VX DSU/CSU								S						S	S	S	S	S	S	S	S	S	S			S
	DL100 Digital Service Mutliplexer								S						S	S	S	S	S	S	S	S	S	S			S
	DL3200 Digital Service Interface													S	S	S	S	S	S	S	S	S	S	S			O
	DL3000 Digital Service Multiplexer						S		S					S	S		S	S	S	S	S	S	S	S			O
	DL3100 Digital Service Multiplexer						S							S	S		S	S	S	S	S	S	S	S			O
Dowty Communications, Inc., (800) 227-3134	DCP3555														S	S	S	S		S	S	S	S	S			O
	DCP4857						S			S					S	S	S	S	S	S	S	S	S	S			O
	DCP9506, 9401	O					S			S			O	O	S	S	S	S	S	S	S	S	S	S			O
	DCP9900, 9115	O	S	S	S	S	S	O	O	S	S	O	O	S	S	S	S	S	S	S	S	S	S	S			O
DSC Communications Corp., (214) 519-3000	CP3000			S	S		S	S	O	S	O	S	S	O	S		S	S	S	S	S	S	S				O
	CP4000			S	S		S	S	O	S	O	S	S	O	S		S	S	S	S	S	S	S				O
Gandalf Systems Corp., (609) 424-9400	Infotron 2000		S	S	S	O	S	O	S	S					S	S	S	S	S	S	S	S	S		O	O	S
	Infotron 2300	O	S	S	S	O	S	O	S	S	S				S	S	S	S	S	S	S	S	S		O	O	S
	Infotron 2120		S	S	S	O	S	O	S	S	S				S	S	S	S	S	S	S	S	S		O		S
General DataComm, Inc., (203) 574-1118	TMS		S	S	S	S	S	O	S	S					S	S	S	S	S	S	S	S	S		O (2)	O	S
	SONET TMS		S	S					S	S	S	O			S	S	S	S	S	S	S	S	S				S
Granger-Telettra, (408) 944-9190	DTM 45								S					S	S	S	S	S	S	S	S		S				O
	DTI 45								S					S	S	S	S	S	S	S	S		S				O
Integrated Network Corp., (908) 218-1800	CM-ET1						S	S	S						S	S	S	S	S	S	S	S	S	S			
Larse Corp., (408) 988-6600	Diversi-T 100 Inverse Multiplexer	O	S		S	S	S		S						S	S	O	S	S	S	S	S					
	Diversi-T 1400 Inverse Multiplexer	O	S		S	S	S		S						S	S	O	S	S	S	S	S					
	Mega-T Network Service Unit	S	S		S	S	S		S						S	S	S	S	S	S	S	S					
	Split-T Fractional T-1 Multiplexer	S	S	S	S	S	S		S						S	S	S	S	S	S	S	S					O
	Access-T Network Access DSU/CSU	S	S	S	S	S	S		S						S	S	S	S	S	S	S	S					O
	Access-T45 DS3 Network Service Unit			S	S	S	S		S						S	S	S	S	S	S	S	S					
Micom Communications Corp., (800) 642-6687	Marathon 5K			S	S		S			S	S	S	S	S	S		S	S	S		S	S	S	S			O
	Marathon 1K			S	S		S			S	S	S	S	S	S		S	S	S		S	S	S	S			O
Motorola Codex, (508) 261-4000	6250		S	S	S	S			O	S	S	S	S		S			S		S	S	S	S				S
Network Equipment Technologies, Inc., (415) 366-4400	ADNX/48		S	S		S	S		S	S		S				S	S	S			S	S	S				O
	ADNX/60		S	S		S	S	O	S	S		S	O	S			S	S	S		S	S	S		S		O
	IDNX/20		S	S		S	S	S	S	S	S	S			S			S	S		S	S		S			O
	IDNX/20-S		S	S		S	S	S	S	S	S	S			S			S	S		S	S		S			O
	IDNX/70		S	S		S	S	S	S	S	S	S			S			S	S		S	S		S			O
	IDNX/90		S	S		S	S	S	S	S	S	S			S			S	S		S	S		S			O
Network Equipment Technologies, Inc./Adaptive, Inc., (415) 366-4400	STM/18	S	S	S	S	S	S	S	S	S	S				S	S	S	S	S	S	S	S	S	S			O
Netrix Corp., (703) 742-6000	#1-ISS		S	S	S	S	S	O	S	S	S				S	S	S	S	S	S	S	S	S				S
Newbridge Networks, Inc., (703) 834-3600	3600 Mainstreet		S	S	O	S	S	O	S	O	S	O	O	O	O	S	S	S	S	S	O	S	S		S	O	O	O
	3606 Mainstreet Little Mux				O	S	S		S	O	S	O		O	O	S	S	S	S	S	O	S	S		S	O	O	O
	3612 Mainstreet Narrowband Multiplexer		S	S	S	O	S		S	O	S	O	O	S	O	O	S	S	S	S	S	S	S		S	O	O	O
	3624 Mainstreet Intelligent Channel Bank				O	S	S		S	S	S	O	O		O	O	S	S	S	S	O	S	S		S	O	O	O
	3630 Mainstreet Primary Rate Multiplexer		S	S	S	O	S		S	S	S	O	O	O	O	S	S	S	S	S	O	S	S		S	O	O	O
	3645 Mainstreet		S	S	S	O	S		S	S	S	O	O	O	O	S	S	S	S	S	O	S	S		S	O	O	O
Northern Telecom, Inc., (404) 840-5000	DE-4E Smart	S	S				S	S		S	S				S	S		S	S		S	S		S			O
Paragon Networks International, Inc., (203) 740-1800	PNP-800/8000 Series		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	O (2)	S
Penril Datacomm Networks, (301) 921-8600	Series 1544			S	S	S			O	S	S				S	S	S	S	S	S	S	S		S			O
Primary Communications, Inc., (619) 458-5861	Metro-T			S			S			S					S	S	S	S	S	S	S	S	S	S			S
Pulse Communications, Inc., (800) 841-1005	T1 Business Bank			S					O	O			O	O		O	O	O	S	S	S	S	S				O
Racal-Datacom, (800) 722-2555	Omnimux 800 TDM			S	S	S	S	S	S	S								S	S		S	S	S	S	O		O
	Omnimux 800 FT-1			S	S	S	S	S	S	S								S	S		S	S	S	S	O		O
	Omnimux 7000			S	S	S	S	S										S	S		S	S	S	S			O
	Omnimux 8000		S	S					S	S	S		S		S			S	S		S	S	S	S			S
	Omnimux 9000		S	S					S	S	S	S	S		S			S	S		S	S	S	S			S
RAD Data Communications, Inc., (201) 529-1100	MP 2000 Series			S	O	O	S		S	O	S	O	O	O		S	S	S	S	S	S	S	S	S			S
Raycom Systems, Inc., (818) 909-4186	Model 5110			S	S				O	S					S			S	S		S	S	S	S	O		S
	FiberRing 100			S	S		S		O	S				S	S			S	S		S	S	S	S	O		S
Republic Telcom Systems Corp., (800) 822-6227	RLX-D Series Multiplexing System		O	S	S	S			O	S	S	S	S	S	S			S	S	O	S	S	S	S			S
StrataCom, Inc., (408) 294-7600	IPX FastPacket Networking Switch		S	S	S	S	O		O	S					S	S	S	S	S		S		S			S	
T3plus Networking, Inc., (408) 727-4545	BMX 45 Bandwidth Manager			S	S	S	S	S	S	S					S		S	S	S	O	S	S					O

T-carrier multiplexer features and options

Company	Product	Inverse mux support	Tandem switching support	Manual route selection	Automatic route selection	Time-of-day route selection	Downline loading	Upline loading	Redundant power	Password security	Channel prioritization	Subrate data muxing	Subrate voice muxing	Dynamic bandwidth allocation	Supervisory/net mgmt. port	ESF monitoring	Software configurable	Local/remote loop-back testing	Self-testing	Bit error rate testing	Alarm displays	LED	Front-panel display	External display terminal	IBM's NetView	AT&T's Accumaster Integrator	Proprietary
Telco Systems Network Access Corp., (800) 776-8832	DCB-24						S	S			S	S	S	S				S	S			S	S	S			
	DDI-24						S	S			S	S	S	S				S	S			S	S	S			O
	DCB-24DD						S	S			S	S	S					S	S			S	S	S			
	Route-24						S	S		S	S	S	S	S	S	S	S	S	S			S	S	S			O
	Route-24DD						S	S		S	S	S	S	S	S	S	S	S	S			S	S	S			O
Telematics International, Inc., (305) 772-3070	DX			S	S	O	O	O	O	S	S		S	S	S	S	S	S	S	S	O	S	S	S			S,O
Tellabs, Inc., (708) 969-8800	Crossnet Bandwidth Management System	O	S	S	S	S	S	S	S	O	S	S	S		S	S	S	S	S	S	S	S	S	S	O		O
TxPORT, (800) 926-0085	1564A			S			S			S	O				S	S	S	S	S	S	S	S	S	S	S	S	
TyLink Corp., (508) 285-0033	ONS 400					S	O					S	S	S	S	S	S	S	S	S	S	S	S	S			O
	SNS 4000	S				S	O					S	S	S	S		S	S	S	S	S	S	S	S			O
Verilink Corp., (408) 945-1199	Access System 2000			S			S			S	S				S	S	S	S	S	S	S	S		S	S		S

(1) Clearview system from Clear Communications, Inc.
(2) IBM NetView PC only.

ESF = Extended superframe format
O = Optional
S = Standard
TMS = Transport Management System

SOURCE: TELECHOICE, INC., MONTCLAIR, N.J.

become one of the hottest topics in networking.

Basically, inverse multiplexing enables a device receiving a high-rate bit stream to spread it across multiple dial-up or dedicated 56K/64K bit/sec circuits. For example, a 384K bit/sec bit stream from a videoconference coder/decoder would be spread across six 64K bit/sec circuits. The inverse mux at the receiving end presents data from those six circuits to the receiving video-conferencing codec as it was sent.

The growing popularity of stand-alone inverse multiplexers has prompted T-carrier multiplexer vendors to add the capability to their products via add-on boards or through the integration of inverse mux modules into the chassis.

Provision of the capability does not create a great technical problem. In fact, many T-carrier mux vendors buy the technology from inverse multiplexer vendors such as Promptus Communications, Inc. of Portsmouth, R.I. Firms such as Ascend Communications of Alameda, Calif., Digital Access Corp. of Reston, Va., and Teleos Communications of Eatontown, N.J., sell stand-alone inverse muxes.

Several makers of high-end T-carrier multiplexers have announced or released products that incorporate inverse multiplexing technology into their products as standard or optional features. Some of these vendors are taking steps to ensure that their stand-alone or T-carrier multiplexer-resident inverse muxes can interoperate.

Newbridge, in fact, is a founding member of the Bandwidth on Demand Interoperability Group, or BONDING. The group recently announced a set of interoperability standards for inverse multiplexing equipment. The aim of these standards is to reduce the emphasis on proprietary technology that has limited interoperability among T-carrier multiplexers. The first set of BONDING specifications is currently awaiting approval.

Inverse multiplexing support removes or at least reduces the need for dedicated digital circuits between certain locations. Of course, in most areas, users still need at least a T-1 or, more likely, an Integrated Services Digital Network Primary Rate Interface (PRI) circuit to access 56K/64K bit/sec dial-up data services.

ISDN

However, relatively few T-carrier multiplexer vendors currently supply ISDN interfaces. This may change as ISDN is used to access switched digital services and to support inverse multiplexing and applications such as video-conferencing. Therefore, T-carrier muxes should have at least one ISDN interface.

The more important ISDN interface for buyers of T-carrier multiplexers is PRI, which specifies 23 64K bit/sec voice or data B channels and one 64K bit/sec D channel used for signaling. Of lesser importance to T-carrier multiplexer buyers is the Basic Rate Interface (BRI), which supports two 64K bit/sec B channels and one 16K bit/sec D channel.

ADC Kentrox, Ascom Timeplex, Gandalf Systems Corp., GDC, Larse Corp., StrataCom and TyLink offer PRI. Only two companies offer BRI: Pulse Communications, Inc. and Telco Systems Network Access. None of the vendors listed offer both BRI and PRI

T-carrier mux vendors offer an increasing array of voice compression techniques.

▲▲▲

at this time.

There are several reasons usually given for the lack of ISDN support in T-carrier multiplexers. First has been the lack of ISDN service outside of a few major metropolitan areas.

Second is differences in the ISDN signaling systems championed by different carriers. AT&T, MCI Communications Corp. and Sprint Corp. use varying versions of CCITT Signaling System 7, with enough incompatibilities to make interconnection among the different carriers' services difficult.

Technologically, it's relatively simple to add ISDN PRI or BRI functionality to high-end multiplexers through add-on boards and software. However, this does not mean such development is cheap. Thus, vendors are not going to put the effort into such development until they see substantial demand from customers.

As with frame relay interfaces, varying implementations of ISDN standards dictates that users must make sure they learn which vendor's ISDN interface is capable of working with which carrier's ISDN service.

While T-carrier mux makers seem reluctant to add ISDN to their products, they are not holding back on adding voice compression features, especially to their high-end products. In an effort to combat the defection of voice traffic to switched services, T-carrier multiplexer vendors are offering an ever-increasing array of voice compression techniques.

Voice compression

Today's voice compression techniques, such as Code Excited Linear Prediction (CELP), can squeeze voice into 8K bit/sec of bandwidth instead of the traditional 64K bit/sec required from pulse code modulation or the 32K bit/sec required by adaptive differential pulse code modulation.

Several vendors, such as Ascom Timeplex, Gandalf Systems, Micom and Republic Telcom, utilize proprietary methods of voice compression to support voice at 8K or 16K bit/sec.

Standard and proprietary compression schemes are extremely complex. CELP, for example, uses an algorithm that recognizes standard patterns of human speech and predicts what sounds are likely to occur, thereby reducing the number of actual signals being transmitted. Such complexity makes the development and implementation of voice compression expensive, which is why most vendors offer it on their high-end, more expensive multiplexers.

Interoperability

Even though a vendor may put one or all of these features on its T-carrier mux doesn't mean the mux will work with those made by other vendors. There is some measure of intercommunication between multiplexers of different vendors, but it's still fairly limited due to the prevalence of proprietary implementations of various multiplexing schemes.

The real advantage for users in the current situation is that if they use a single vendor's backbone and feeder multiplexers, the network should suffer few, if any, compatibility problems.

The technological advances rolled out in the past 12 to 18 months have underscored an increasingly obvious point: It's not as expensive to build and use private networks as it was a few years ago. Users are taking advantage of switched network alternatives, and the result is the rise in hybrid public/private networks.

Multiplexers with LAN bridging capabilities

Company	Telephone	Product	Ethernet	Token ring	Arcnet	StarLAN	10Base-T	T-3	T-1	DDS	Other
			LANs supported					Speeds supported			
ADC Fibermux	(818) 709-6000	Magnum 100	✔	✔	✔			✔			
Dowty Communications, Inc.	(800) 227-3134	DCP4857	✔						✔		FT
Gandalf Systems Corp.	(609) 424-9400	Infotron 2300	✔	✔					✔	✔	D, FR, FT, P, S
General DataComm, Inc.	(203) 574-1118	Transport Management System (1)	✔	✔		✔			✔	✔	D, FR, FT, P, S
Micom Communications Corp.	(800) 642-6687	Marathon 5K	✔							✔	D, FT
		Marathon 1K	✔								FT
Netrix Corp.	(703) 742-6000	#1-ISS	✔	✔					✔	✔	D, FR, FT, S
Network Equipment Technologies, Inc.	(415) 366-4400	IDNX/20	✔	✔					✔	✔	D, FT, S
		IDNX/20-S	✔	✔					✔	✔	D, FT, S
		IDNX/70	✔	✔					✔	✔	D, FT, S
		IDNX/90	✔	✔				✔	✔	✔	D, FT, S
Newbridge Networks, Inc.	(703) 834-3600	3600 Mainstreet	✔	✔					✔	✔	D, FT, S
		3606 Mainstreet Little Mux	✔	✔					✔	✔	D, FT, S
		3612 Mainstreet Narrowband Multiplexer	✔	✔					✔	✔	D, FT, S
		3624 Mainstreet Intelligent Channel Bank	✔	✔					✔	✔	D, FT, S
		3630 Mainstreet Primary Rate Multiplexer	✔	✔					✔	✔	D, FT, S
		3645 Mainstreet	✔	✔				✔	✔	✔	D, FT, S
RAD Data Communications, Inc.	(201) 529-1100	MP 2000 Series	✔	✔					✔	✔	D, FT
Raycom Systems, Inc.	(818) 909-4186	Model 5110	✔	✔	✔		✔		✔		D, FT
		FiberRing 100	✔	✔	✔		✔		✔		D, FT

(1) LAN bridge capability under development.

D = DS0
DDS = Digital data service
FR = Frame relay
FT = Fractional T-1
P = ISDN Primary Rate Interface
S = Switched 56K/64K bit/sec

SOURCE: TELECHOICE, INC., MONTCLAIR, N.J.

Another obvious point is that users are looking for ways to save money while fulfilling their connectivity needs. Putnam Fiduciary, for example, installed inexpensive multiplexing DSU/CSUs to perform the same functions that would have required a set of expensive T-1 muxes a few years ago. The makers of T-carrier multiplexers, quite aware of this trend, have focused on providing more efficient use of private net-working facilities in developing links to public net-based services.

T-carrier multiplexers are now and will continue to be an important, integral part of the U.S. and international networking topology that will likely never be entirely replaced by public services. But the network won't look like it did just a short while ago, and T-carrier muxes are changing to accommodate this. ⊇

Guptill is an associate with

TeleChoice, Inc., a Montclair, N.J., consultancy specializing in strategic planning and analysis of intelligent networks, services and applications. He can be reached at (201) 746-0200.

Letters

I would like to clarify several points that Eric Schmall made in his recent article.

As managing director of a retained executive search firm that specializes in data communications and telecommunications, I am often referred to as a headhunter. Unfortunately, the term is used to describe a wide range of recruiters — from contingency recruiters who, like the firm referred to in the article, will "flood your fax with resumes" to retained professional search consultants who establish close and exclusive working relationships with their clients and only refer the most qualified candidates.

I agree with the comment made in the article that the "whole point of engaging a headhunter is to save yourself time and energy." An executive search consultant with a retained executive search firm will:

■ Spend considerable time with the client to define the position and candidate requirements. Candidate requirements will include specific experience required as well as personal characteristics necessary to be successful for that specific client.

■ Have experience in the client's industry and product area and be able to effectively evaluate potential candidates compared with other individuals in the industry.

■ Carefully screen potential candidates by telephone and through personal interviews and present a limited number of qualified candidates to the client.

A retained executive search consultant will save clients considerable time and energy. The article gives excellent advice on selecting headhunting firms, and I recommend that network managers follow all these suggestions. But they must make certain they are dealing with a professional retained search executive, not just a headhunter. Many retained executive search firms are members of the Association of Executive Search Consultants.

C. Hale Cochran
Managing director
FenwickPartners
Lexington, Mass.

I'm writing regarding Eric Schmall's article. As a professional recruiter in the local- and wide-area network marketplace, I think this article hit the nail right on the head. Mr. Schmall made three major points, which can be used as a guide to conduct a successful search.

The first was to ask the recruiter for references. Hiring an employee or consultant requires that the net manager demand references. When engaging a recruiter, net managers must do the same.

Second, it's a good idea to ask the recruiting firm how it intends to present prospective candidates. Here's how I view the process. The first seemingly qualified candidate should be presented verbally to the network manager. This allows the recruiter and the net manager to discuss why the candidate is off the mark.

The recruiter then has a better idea of the kind of candidate the net manager is seeking.

Third, the net manager should give the recruiter all the information needed to properly market the firm's opportunity. The company's goals, management philosophy and financial stability as well as the candidate's potential career path are just a few items that should be included.

Remember that headhunters are your marketeers. Give them the proper ammunition to market your opportunity and the chances of finding the proper candidate will markedly increase.

Edward Doran
National accounts manager
MRD Group
Executive Recruiters
Temecula, Calif.

CLARIFICATION: The June 1 Buyer's Guide on LAN wiring hubs omitted the following entry for David Systems, Inc.

Company	Telephone	Product	Hub type (C=Chassis, B=Board, S=Stand-alone)	Ports	LANs (V=Varies)	Slots	AppleTalk	Ethernet	FDDI	Token ring	Other	Coaxial	Fiber	IBM	Shielded twisted pair	Unshielded twisted pair	Other	Frame relay	T-1	X.25	Other	Alarms	Fault management	Traffic monitor	CMIP	CMOT	SNMP	Other	Bridging/Routing (A=AppleTalk, E=Ethernet, F=Fiber, T=Token ring, O=Other)	Starting price
DAVID Systems, Inc.	(800) 762-7848	VolksNet Hub	S	13	1		✔			✔	✔	✔										✔	✔							$795
		ExpressNet Hub	S	13	1			✔		✔	✔	✔	✔									✔	✔	✔			✔	✔		$1,695
		DAVID ExpressNet 5-slot Concentrator	C	48	4			✔		✔	✔		✔						✔	✔	✔	✔	✔	✔			✔		E	$1,995
		DAVID ExpressNet 12-slot Concentrator	C	132	11			✔		✔	✔		✔						✔	✔	✔	✔	✔	✔			✔		E	$2,295
		ExpressBus Concentrator	C	132	10		✔	✔	✔	✔	✔	✔	✔						✔	✔	✔	✔	✔	✔			✔		E	$1,995

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Taking the work out of virus detection

Tests show some TSR/device driver antivirus programs are better than others.

By CHARLES BRUNO

Life is filled with mundane but important tasks that are often neglected. Parents coax children to brush their teeth, tax preparers urge citizens to file their taxes by April 15, and net managers remind end users to run antivirus software regularly.

The fact is, while most people have healthy teeth due to regular brushing and are in good standing with the Internal Revenue Service, many network users are vulnerable to virus attacks because they rarely use virus protection products.

The problem is that users are either unskilled at running the programs or don't use them consistently.

But net managers shouldn't give up hope of ensuring adequate security down to each local-area network-attached workstation.

In the latest evaluation of *Network World's* Network Security Test Series, the International Computer Security Association (ICSA) ran a battery of 120 tests on each of 20 terminate-and-stay resident (TSR) and device driver antivirus packages, concluding that five programs outperformed the others.

TSR antivirus programs run in a personal computer's memory and monitor for viruses or virus action, as well as report on or prevent suspicious activity. The programs act as constant sentinels, watching over file copy operations and other processes, and intervening to thwart an infected file from being copied onto a user's local hard disk.

In its evaluation, the ICSA reviewed products that may have already been replaced with newer versions. As a rule of thumb, if you are using a version of a product that is different from the version reviewed here or are considering purchasing a different version, then this report would best serve as a general guide for asking questions.

TSR or device driver?

When users consider background virus protection in the form of memory-resident software, they have a choice between a device driver program that loads through CONFIG.SYS files or a TSR that loads in AUTO-EXEC.BAT files.

A TSR-based antivirus program may be resident on a user's PC and booted when the PC is started. The TSR can also be physically located on a server, so multiple users can share copies of the file. While this approach simplifies upgrades for net managers, it also has a downside: The PC user must log on to the server in order to get to the TSR. This creates a lag during which the PC can become infected.

Device driver antivirus programs are located on the PC and listed in a CONFIG.SYS file, so they are loaded when the PC is powered up.

There are advantages and disadvantages to both of these program types (see graphic, this page). If user requirements vary from machine to machine, the best alternative may be a product that offers device driver and TSR modules — such as Central Point Software, Inc.'s Anti-Virus, S&S International's Dr. Solomon's Anti-Virus Toolkit or Leprechaun Software International, Ltd.'s VirusBuster.

Evaluating antivirus products is not a simple task. There are many products and features that merit exploration. Furthermore, most users do not have the time — or the virus collection — to conduct a thorough evaluation of antivirus products. Because it is not feasible to evaluate a TSR or device driver solely, the ICSA's evaluation focuses on the TSR and the device driver portion

of virus protection products (see chart, page 63).

In this report, XTree Co.'s ViruSafe LAN and Central Point Software's VSAFE.COM came out on top with a score of 82% each, followed closely by XTree's ViruSafe at 81%. S&S International's Dr. Solomon's Anti-Virus Toolkit and Symantec/Peter Norton Group's Norton AntiVirus software both scored within four points of the top performers.

Rating the products

The ICSA's ratings are based on a series of tests that examine product features and their ability to detect the presence of specific viruses.

Some vendors emphasize raw detection of viruses while downplaying such features as ease of installation, speed or use of memory. Other vendors emphasize these features in addition to the virus protection capabilities of their products.

"Our view is that of users," says David Stang, the ICSA's director of research who oversaw the testing. "A product that lacks features is not desirable, no matter how many viruses it detects."

In the ICSA's scoring system, a product could have received a maximum of 244 points on features tests and 350 points on detection tests. Products earned points for the completeness and sophistication of the features reviewed, as well as their ability to detect and react to the presence of viruses.

Comparing features

Overall, the top five performers from a features standpoint

are: XTree's ViruSafe LAN, Symantec's Norton AntiVirus (NAV&.SYS), Central Point Software's VSAFE.COM, S&S International's Dr. Solomon's Anti-Virus Toolkit and XTree's ViruSafe, with scores of 90%, 89%, 88%, 87% and 87%, respectively.

In the evaluation of the products' features, the ICSA first looked at installation, giving a total of 20 points to any product that exhibited ease of installation. Within this evaluation, products were rated on the clarity of installation instructions, error messages and the ability to be installed in workstation memory when the user logs on to the net, among other things.

Certus International Corp.'s Novi faired well here. The installation program is extremely intuitive, meaning a user can install it without the manual. It is also easy to use for even the most inexperienced user, according to Stang. Messages were clear and understandable.

Fifth Generation Systems' Untouchable LAN scored high in this category, too. "Considering this product is installed on a LAN [server], you can modify everyone's login script to scan them when users log in," Stang says. "We consider networkwide installation to be wonderfully easy."

S&S International's Dr. Solomon's Anti-Virus Toolkit took top honors along with Certus' Novi for installation. The ICSA says this product "is the standard against which others should be judged for installation. It is quick, easy, intuitive and completely successful. All messages were clear," he reports.

Another important feature evaluated was ease of learning and ease of use. Here, almost all the products did extremely well because most are well-organized and allow the user to learn program operation quickly.

Fifth Generation Systems' Untouchable and Untouchable LAN, Stang says, are quite intuitive, requiring little use of a manual. FRISK Software's F-Prot also is intuitive. "The interface is perhaps the best of the products reviewed," Stang says. "First-time users will have no problem with it."

There are, however, some exceptions. McAfee Associates' VSHIELD is not intuitive at all. Users will likely have to dive into the documentation files to get things done. And there isn't a graphical display. Microcom, Inc.'s Virex also may require users to ferret through the documentation.

Ease of use aside, any TSR antivirus program must have adequate security features. Users should look for products that scan programs during load and execute operations, as well as during copy and write operations. In addition, the product should prevent any virus-infected file from running. And the package should allow a net manager to configure the TSR so only he can reconfigure it. In the test, each product could score 35 points for this feature.

Certus' Novi received a perfect score. "The TSR can scan on any file open; it is very efficient and quite secure," Stang says. It also will not allow an infected file to run and comes with adequate password protection.

Symantec's Norton AntiVirus and Leprechaun Software's VB-SHIELD.SYS and VBSHIELD.COM also received perfect scores for security.

TSR and device driver comparison

	Advantages	Disadvantages
Terminate and stay resident (TSR)	Can be installed from login script to network. If needed, can be removed from memory without rebooting for large application.	Loads after a virus might be loaded (for instance, infected COMAND.COM) and, thus, may be subverted by it.
Device driver	Can be installed as first line of CONFIG.SYS file, prior to any file virus running.	Cannot be installed in user workstation memory from login script to LAN. Cannot be removed from memory without changing CONFIG.SYS file and rebooting.

SOURCE: INTERNATIONAL COMPUTER SECURITY ASSOCIATION, WASHINGTON, D.C.
GRAPHIC BY SUSAN SLATER

This test was conducted by the International Computer Security Association (ICSA) as part of the *Network World*/ICSA Network Security Test Series. The ICSA's mission is to help personal computer and local-area network users improve the security of their information systems, reduce the threat of computer viruses and ensure the integrity of their information resources.

The findings in this article were based on a comprehensive 80-page report on terminate-and-stay resident and device driver antivirus packages. The report contains the results published in this article, as well as additional findings and background information on the tested products.

For more information, contact the ICSA's Virus Research Center at (202) 364-8252.

International Microcomputer Software, Inc.'s (IMSI) Protect received only three out of a possible 35 points because it failed to identify the Jerusalem virus infecting memory and a virus being copied. Furthermore, the program allows an infected file to run, and password protection is inadequate.

Another step beyond general security is the products' ability to monitor files coming from and going to the server, also known as server protection. In this test, the ICSA reviewed whether files copied from the server can be monitored and whether the product can monitor files as they are copied to the server.

Central Point Software's Central Point Anti-Virus, Certus' Novi and Leprechaun Software's VirusBuster all received the maximum eight points for server protection.

With regard to monitoring files copied from or to the server, Novi identifies the virus in the file, halts the copy process and offers to remove the virus from the file.

Several TSRs, including Fifth Generation Systems' Untouchable, FRISK Software's F-Prot, McAfee Associates' McAfee, IMSI's Protect and Microcom's Virex offered no monitoring of files copied to or from the server.

Speed tells

While server monitoring is important, a bigger issue may be that TSR virus protection programs should not add excess time to the boot process on a user's PC. In this test, the ICSA found that Certus' Novi and Microcom's Virex added significant time to the boot process compared to other TSRs.

While speed may be a limiting factor, use of memory is also crucial for efficient program use. The ICSA found that Leprechaun Software's VBSHIELD.COM consumes just 4.1K bytes of memory, S&S International's Dr. Solomon's Anti-Virus Toolkit uses 5.2K bytes, and Fifth Generation Systems' Untouchable LAN uses only 5.6K bytes of random-access memory.

At the other extreme, Microcom's Virex uses 48.9K bytes of RAM to run its software, and Symantec's Norton AntiVirus NAV. SYS uses 39.2K bytes.

"Most net users are forever running out of memory for their applications," Stang says. "So the size of a TSR or device driver program is crucial."

With any antivirus TSR or device driver program, network administrators will have to rely on the package's reporting capabilities and messages in order to relay information. Desirable fea-

tures in this area include customization of alert messages, audible warning upon detection of a virus and advice accompanying alert messages.

Certus' Novi graded well in its ability to provide the user many options for customizing messages. The choices are given in a clear, menu-driven format.

S&S International's Dr. Solomon's Anti-Virus Toolkit does offer an audible alert, but it does not prepare a log of the event's detection date, the file infected and the nature of infection, or send a log file to the printer.

Another important aspect of messages is whether they are accompanied by appropriate advice. S&S International's Dr. Solomon's Anti-Virus Toolkit offered the best message advice and detailed supporting documentation. When the program detects a virus, it will not let the user proceed; the only option is to stop and not execute the file. According to Stang, the product documentation also offers detail on specific viruses as well as policies that relate to virus attacks.

ICSA testers encountered difficulty with Fifth Generation Systems' Untouchable LAN on this test. When users logged on, they received a "Network error on server" message and were logged out. At other times during the testing, the system hung. There is also little documentation on specific viruses or general virus protection techniques.

Likewise, IMSI's Protect offered inadequate advice to the

user, and the program allowed ICSA testers to run an infected file.

Network operation

While TSR or device driver portions of antivirus products are not expected to run on the server, a product's scanner should be able to view activity there. ICSA testers checked the products' ability to notify a supervisor and other users, as well, of virus presence on the server.

Central Point Software's CPAV.EXE scanner dispatched a message to the supervisor when it detected a server virus and was able to send the report to any user name. Fifth Generation Systems' Untouchable LAN also detected the virus and allowed other users to be notified. Likewise, XTree's ViruSafe LAN caught the virus and could notify as many as 16 users simultaneously.

However, XTree's ViruSafe, S&S International's Dr. Solomon's Anti-Virus Toolkit, Fifth Generation Systems' Untouchable, FRISK Software's F-Prot and IMSI's Protect cannot report this to the supervisor or another user.

Detection scores

Another portion of the TSR evaluation focused on the products' ability to sniff out the presence of specific viruses and eradicate them.

The top five performers from a detection standpoint were Mc-

Afee Associates' VSHIELD, Symantec's Norton AntiVirus, XTree's ViruSafe and ViruSafe LAN, and S&S International's Dr. Solomon's Anti-Virus Toolkit, with scores of 80%, 80%, 77%, 77% and 74%, respectively.

In one test, ICSA staffers tested for the products' ability to load a file after the Stoned virus had infected a disk drive. Central Point Software's VSAFE.COM, Certus' Novi, Fifth Generation Systems' Untouchable LAN, and McAfee Associates' VSHIELD all scored the maximum 30 points. Each of these products detected the virus, correctly identified it and rebuilt the master boot record after the virus was dispatched.

Several of the products, including Central Point Software's VWATCH.COM and VWATCH.SYS and Microcom's Virex, did not detect the virus.

In the event that a memory-resident antivirus product is loaded after a virus is loaded, the product might fail to detect the virus or operate as the user expects. In this test, the ICSA loaded TSRs after loading the Jerusalem virus into memory.

Since the Jerusalem virus cannot load before a device driver can, those types of antivirus programs are immune to getting hit by the virus. "That's the big pitch for device driver programs," Stang says. By virtue of their position in the boot process, device

drivers must load before a virus has a chance to do so, he adds.

In the ICSA's test, Central Point Software's VSAFE.COM, VSAFE.SYS and VWATCH.SYS, McAfee Associates' VSHIELD, Microcom's Virex and Symantec's Norton AntiVirus all received top points for detecting the virus and removing it.

Central Point Software's VSAFE reported that it had been infected by the Jerusalem virus and then automatically deleted three copies of the virus. During reboot, VSAFE automatically failed its own self-check and offered options to reconstruct itself, continue execution or exit to DOS.

Certus' Novi failed the test, as it could not detect the Jerusalem virus, nor could it repair itself after the TSR had become infected.

Unlike Jerusalem, the virus known as 4096, 4K and Frodo is able to infect SETVER — a DOS utility program — and run when installed as a device in CONFIG.SYS, thereby infecting files. When the machine boots, the virus will infect every file the user opens.

With this virus, it is important for the TSR to detect it in memory and flag it. Central Point Software's VSAFE.COM, VSAFE.SYS and VWATCH.SYS, Fifth Generation Systems' Untouchable and Untouchable LAN, Leprechaun Software's VBSHIELD, McAfee Associates' VSHIELD and Symantec's Norton AntiVirus all did the job well.

Summary of features and detection scores

Vendor	Product	Version	Module	Features subtotal	Detection subtotal	Total	Score (based on 100%)
Central Point Software, Inc.	Central Point Anti-Virus	1.2	VSAFE.COM	215	275	463	82
			VSAFE.SYS	167	270	437	74
			VWATCH.COM	202	200	402	68
			VWATCH.SYS	179	240	419	71
Certus International Corp.	Novi	1.0.1		206	245	451	76
Fifth Generation Systems	Untouchable	1.0		190	225	415	70
	Untouchable LAN	1.0		210	225	435	73
FRISK Software	F-Prot	2.02		200	195	395	66
International Microcomputer Software, Inc.	VirusCure	2.32	Protect	91	195	286	48
Leprechaun Software International, Ltd.	VirusBuster	3.89	VBSHIELD.SYS	206	225	431	73
			VBSHIELD.COM	194	185	379	64
McAfee Associates	McAfee	85, 0.2	VSHIELD	167	280	447	75
			VSHIELD1	180	160	340	57
Microcom, Inc.	Virex-PC	2.1	Virex	182	175	357	60
			Virexpro	158	155	313	53
S&S International	Dr. Solomon's AntiVirus Toolkit			212	260	472	79
Symantec/Peter Norton Group	Norton AntiVirus	2.0	NAV&SYS	217	230	447	75
			NAV.SYS	192	280	472	79
Xtree Co.	ViruSafe	4.55		213	270	483	81
	ViruSafe LAN	4.55		219	270	489	82
Maximum possible				244	350	594	100

Scores derived by adding the features and detection subtotals for each product and dividing by 594, the maximum points possible.

SOURCE: INTERNATIONAL COMPUTER SECURITY ASSOCIATION, WASHINGTON, D.C.

NETWORKING MARKETPLACE

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IBM dealt blow by ANSI decision

is a three-level signal encoding technique that specifies how data is transmitted at 100M bit/sec over copper wiring. It was chosen over the two-level Non Return to Zero Inverted (NRZI) approach.

"This is a decision that should drive the standards process," said Jayshree Ullal, vice-president of marketing for Crescendo.

The move leaves IBM with the tough choice of supporting the ANSI specification or continuing to offer products based its own SDDI technology, which is based on NRZI. IBM officials were not available for comment.

"I expect IBM would adapt to the accepted encoding scheme because it's learned its lesson about pushing proprietary stuff," said Martin Palka, senior industry analyst for Dataquest, Inc. in San Jose, Calif.

Charlie Robbins, director of communications research for Boston-based Aberdeen Group, Inc., disagreed. "SDDI is not throwaway technology," he said. "Users want [shielded twisted pair] solutions now, and IBM can deliver that."

George Prodan, product-line manager for high-speed products at 3Com Corp., said the ANSI vote would have an affect on IBM's SDDI approach. "[NRZI] can meet the needs of customers right now. Voting for MLT-3 does not change that," he said.

ANSI's X3T9.5 FDDI Physical Media Dependent Work Group voted 40-1 to accept MLT-3 as the encoding scheme, with 13 members, including IBM, abstaining. 3Com cast the dissenting vote.

The vote was a significant step toward the adoption of a formal standard, according to members of the ANSI subcommittee.

"Instead of testing two proposals, we can now focus on fine-tuning a single approach," said Pat Thaler, principal engineer for the net architecture laboratory for Hewlett-Packard Co.'s Rose-ville, Calif., division, which tested the proposed encoding schemes for radiated emission levels.

MLT-3 proved to be more robust, easily meeting the Federal Communications Commission Class A emissions standard for commercial applications.

The ANSI subcommittee also required the encoding scheme to meet the FCC's more stringent Class B standard for residential uses. MLT-3 passed the test, although narrowly, which is why 3Com voted against it.

"The results showed that neither encoding technique would meet FCC Class B on unshielded twisted-pair cable without further development," Prodan said. "We are committed to those criteria and decided to take a stand with our vote [against] MLT-3." ▨

Adaptive preps ATM switch

this type of product will hurt market growth of FDDI."

Other analysts agree, noting that prices should come down even lower once ATM products start to permeate the market.

ATM/X and Adaptive's SONET Transmission Manager/18 (STM/18), a high-end gigabit-per-second backbone switch, share a common architecture, sources said. But it is not yet known if the first release of ATM/X will be capable of connecting to STM/18.

Adaptive is expected to ship ATM/X before year end. It will be priced at approximately $40,000 in an entry-level configuration. ▨

NCR gateway extends SNMP reach

Internet Protocol nets, whereas the Management Gateway is intended to be local-area network protocol-independent, NCR officials said.

NCR claims its Management Gateway is a different means to the same end as an effort currently under way to replace the SNMP protocol with a functionally superior alternative. That alternative, called the Simple Management Protocol (SMP), is intended to address shortcomings with the SNMP protocol ("Follow-on to SNMP offers wider mgmt.," NW, June 22).

In addition to being protocol-independent, the Management Gateway is intended to allow users to perform bulk file transfers between consoles and managed devices for disseminating large amounts of management data. It also turns the LAN server into a single collection and packaging point for net management information coming from attached devices, thus streamlining the process of sending the data to the management console.

The Management Gateway will run on the company's System 3000 and StarServer E LAN servers under Unix System V. Though LAN protocol-independent, it uses TCP/IP, Open Systems Interconnection or IBM's LU 6.2 to transmit management data from LANs to management stations.

In addition to converting management data between non-SNMP and SNMP formats, the gateway converts network address information on non-SNMP devices into SNMP addresses so the console can easily locate those devices.

It also performs multiplexing so alarms from several types of devices — routers, gateways or hubs — can be forwarded simultaneously to the management console over a wide-area network link. Previously, alarms from only one device type at a time could be forwarded to the console, NCR officials said.

The gateway will include a development kit for customizing the proxy agents to work with the characteristics of any LAN. It will also ship with SNMP multiplexing link libraries that allow the agents to access the multiplexing abilities of the gateway.

Lines up nicely

NCR officials said the Management Gateway is consistent with the objectives of the SMP proposal in that it works over non-TCP/IP networks, allows users to transfer large files between consoles and managed devices, and uses a multiplexed line between the LAN server and the management console.

"The Management Gateway happens to line up with the SMP proposal," said Doug Kevorkian, NCR director of engineering for network and systems management. "But our customers pushed us somewhat [faster] than [the SMP effort] could go."

The SMP specification is due out this week, but conformant products are still a ways off.

NCR did not disclose pricing for the Management Gateway. ▨

Taking the work out of detection

Certus' NOVI did not detect the virus in memory as it was loaded.

Some viruses, like Vienna, do not linger in memory. Instead, they execute in memory and look for another file to infect, which they do repeatedly. Consequently, a TSR designed to scan only memory for viruses could miss one similar to Vienna.

The ICSA staff booted a machine with either a TSR or device driver and then ran Vienna to see what would happen.

XTree's ViruSafe and ViruSafe LAN, FRISK Software's F-Prot, S&S International's Dr. Solomon's Anti-Virus Toolkit and Central Point Software's products all detected and removed Vienna. Certus' NOVI, Fifth Generation Systems' Untouchable and Untouchable LAN, and Symantec/Peter Norton Group's Norton AntiVirus did not detect the virus.

In the event a user's files are infected, some of them may be copied. What occurs during attempts to copy infected files? ICSA asked that in an attempt to determine if the TSR detects the virus in the corrupted files and removes it.

Certus' NOVI, S&S International's Dr. Solomon's Anti-Virus Toolkit, Leprechaun Software's VBSHIELD.SYS and VBSHIELD.COM, McAfee Associates' VSHIELD and Norton Anti-Virus all detected and removed the Jerusalem virus from infected files during a copy process. FRISK Software's F-Prot and IMSI's Protect did not detect the virus.

Copying virus-infected files is one problem, but dealing with viruses on floppy disks is an altogether different issue. A floppy disk with the Cascade virus was inserted into an A: drive, and ICSA staffers attempted to do a directory listing of the diskette. None of the TSR or device driver products detected the virus.

The message here, Stang says, is buyer beware. Users of TSR or device driver antivirus programs should realize that treatment of a floppy disk booth sector will be different from how the program treats infected files.

Server woes

About half of all office microcomputers in North America are connected to LANs that do the bulk of storage, making a server the ideal place for a virus to hide. What happens when a workstation user with virus protection software attempts to run programs stored on the server infected with a virus?

To find out, the ICSA ran Novell, Inc. NetWare 3.11 on a Compaq Computer Corp. SystemPro and infected it with the Jerusalem.Standard virus. ICSA staffers loaded the antivirus TSR or driver as they typically do, logged in and attempted to run an infected program.

Certus' NOVI, S&S International's Dr. Solomon's Anti-Virus Toolkit, Fifth Generation Systems' Untouchable and Untouchable LAN, F-Prot, Norton Anti-Virus and XTree's ViruSafe and ViruSafe LAN detected the virus and removed it.

Only Central Point Software's products encountered problems, producing a "Network error on server" message and then logging the user out.

Price points

Pricing for TSR and device driver antivirus products ranges from a low of $2 for FRISK Software's F-Prot to $165 for a single-user license for Fifth Generation Systems' Untouchable.

Per-node pricing improves dramatically with 10-, 100- and 1,000-license packages. On the LAN side, Fifth Generation Systems' Untouchable LAN costs $695 for a 10-node starter kit, and XTree's ViruSafe LAN costs $595 for a 10-node kit.

While some users may want the best protection money can buy without regard for price, others feeling the pinch of the recession may be concerned about costs.

Still, according to Stang, there is no significant correlation between the price and performance of antivirus TSR or device driver programs. ▨

Time/LAN to get software

tor*32, including a new Remote Service Advertising Protocol (SAP) and Remote Routing Information Protocol (RIP) for its bridge/router to improve its performance in internetworks with multiple Novell, Inc. NetWare servers.

In a typical NetWare environment, each server routinely broadcasts all of its available services and routing tables to the entire internetwork population using Novell's SAP and RIP implementations, respectively.

With Remote SAP and Remote RIP, only changes to service files and routing tables are transmitted, thus reducing by up to 75% the background protocol traffic traversing the net.

In addition, the vendor expanded the protocol support on its bridge/router to include server and user Telnet, an alternative to SNMP that allows a user to remotely configure a bridge/router from any workstation running the Telnet protocol. It also added support for Xerox Corp.'s Xerox Network Systems and Novell's Internetwork Packet Exchange (IPX) protocols over X.25 nets.

All the software enhancements are available now as a free upgrade.

Ascom Timeplex also unveiled a $6,995 dual-port, token-ring module that doubles from three to six the number of token-ring interfaces that can be supported on its bridge/router. The module is available now.

Finally, the vendor unveiled a new FDDI module that works with both its FDDI Concentrator*32 and Time/LAN 100 bridge/router.

It supports single-mode fiber to link LANs within a campus network up to 30 kilometers apart — significantly farther than the 2-km limit for FDDI running over multimode fiber.

The FDDI module costs from $19,500 to $25,000, depending on configuration, and is available now. ▨

Group mulls standard for OSI

vendor can accomplish now," said Joe Mohen, vice-president of Proginet in Uniondale, N.Y. "An FTAM platform is ideally suited for software distribution."

FTAM is an OSI application-level service that allows users to access or move large files among heterogeneous systems.

Novell has expressed interest in Proginet's ESD standard, saying it could ultimately incorporate the standard in its NetWare for FTAM client products.

"While we didn't work directly with Proginet in its ESD presentation, we are interested in it," said Rick Bohdanowicz, product-line manager for NetWare FTAM and Network File Systems. "ESD is the type of application that will stimulate interest in OSI."

In order to support ESD, extensions would have to be incorporated into the existing version of FTAM, said Kevin Bohan, a network manager for Proginet.

"For example, FTAM only provides binary file transfer, not the application protocol needed to identify information about the software, like what release you're sending," Bohan said.

ESD would work through FTAM on any computer on a network, using X.500 directory services to call desired clients or groups of clients. Once a link is established with clients, ESD would send an electronic file with the software update.

While Proginet is working to have ESD adopted as a standard, products implementing it would likely be a couple years away. Still, at least one big OSI user was excited about the proposal.

"There is a clear requirement to implement a standards-based software distribution platform within the USDA," said Doug Harsha, a computer specialist with the U.S. Department of Agriculture in Fort Collins, Colo. "We do all of our software distribution by mail, which is obviously not the most effective solution."

COS also supports the new software distribution proposal. According to Derek Robinson, COS Mark manager in Vienna, Va., "The proposal is technically feasible and addresses a real-world problem." ⚡

LSI Logic lauds AT&T's service

Before using InterSpan, LSI Logic linked 14 design centers via 19.2K bit/sec analog lines to hub sites here and in Waltham, Mass. The company uses Wellfleet Communications, Inc. routers to link each design center's local-area network to the T-1 line used to access the frame relay service.

The net is used to ship large image files that represent custom semiconductor designs. Anderson said a typical 100M-byte file brought the company's 19.2K bit/sec net to its knees.

Frame relay

To remedy the problem, the company first considered a private T-1 net, but at $283,000 per month, it was deemed too expensive. A 256K bit/sec fractional T-1 net would cost roughly $89,000 a month, but the service was not available at all required sites, Anderson said.

So when AT&T approached the firm in September 1991 to discuss frame relay, LSI Logic was all ears. The semiconductor maker also listened to WilTel's frame relay pitch but decided on AT&T because it offered a wider array of access port speeds at the time and was available in more locations, Anderson said.

"It would've cost us a bundle to run T-1 access lines from some of our locations to the nearest WilTel [point of presence]," he added.

LSI Logic opted for InterSpan's 256K bit/sec access port speed and a committed information rate (CIR) of 512K bit/sec.

The typical 100M-byte file that used to take all day to transmit can now be sent in a couple of hours. Additionally, software updates that used to take one to two hours can now be sent in about five minutes, according to Anderson.

He added that LSI Logic is spending roughly $50,000 a month for InterSpan and hopes to eventually negotiate a long-term contract for frame relay service with AT&T.

Although the firm is pleased with the service, it would like to learn more about its performance, such as whether the company is bursting above its CIR. Today, the only way it can find out is to send files to each design center and measure how long it takes for them to arrive.

The semiconductor vendor also hopes to eventually use InterSpan's integrated access capability, which allows companies to use a single T-1 link to simultaneously access multiple network services. "We're talking about using integrated access at many sites to carry both data and voice," Anderson said. ⚡

Windows opens wider to sources

To further aid developers, Microsoft and Sybase announced a new SQL Server Software Development Kit (SDK) for Windows NT, Microsoft's new 32-bit operating system that is expected later this year.

The kit will help developers migrate Windows-based client/server applications to the Windows NT platform.

"Since ODBC is fundamental to our Windows strategy, it was important to provide a way to access both Oracle and Sybase databases," said Gary Voth, senior product manager for client/server applications at Microsoft.

ODBC is a Windows-based application program interface (API) based on the SQL Access Group's Call Level Interface (CLI), which defines a common way for applications to access SQL databases.

Analysts agreed that Microsoft needed the support of the leading database vendors to ensure the success of ODBC.

"These announcements are the kickoff," said Chris Le Tocq, senior research analyst with Info-Corp in Santa Clara, Calif. "Microsoft had to make these moves to get others to jump on the bandwagon."

"This is an evolutionary next step," said Tom Willmott, vice-president of Aberdeen Group, Inc., a consulting firm in Boston. "Users will now be able to extend the reach of their database queries beyond the LAN into the enterprise network."

Even though ODBC is not expected to be available until later in the year, vendors say they are getting pressure from users to announce support.

"Oracle is jumping in with Microsoft in an effort to help our common customers gain easy access to Oracle servers from their Windows applications," said Fred Cutler, vice-president of business development at Oracle.

Oracle's John Kish, vice-president of desktop products, said his company has already worked with Microsoft to define and incorporate new features in ODBC that are not in the SQL Access Group's specification. He added that ODBC is a superset of CLI and that support was added for other features such as arrays.

The ODBC effort expands the five-year relationship between Microsoft and Sybase, which has already announced plans to port SQL Server to Windows NT. In addition to developing the ODBC driver, Sybase plans to build

> "**M**icrosoft had to make these moves to get others to jump on the bandwagon."
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ODBC into its Open Client API, client software that provides a link to SQL Servers on a variety of platforms.

SDK for Windows NT will enable the delivery of SQL Server applications on the new 32-bit Windows NT platform. The kit contains native Win32 API versions of SQL Server's DB-Library client interface and Open Data Services API, which is based on Sybase's Open Server connectivity software.

Developers can use the SDK with Microsoft's SQL Server 4.2 today or with a native 32-bit release of SQL Server for Windows NT when that product is available.

The preliminary SQL Server SDK for Windows NT, priced at $295, is expected to be available in July.

Both the Oracle Server and SQL Server drivers are expected to be available with ODBC when it is available later this year. No pricing was announced. ⚡

Concerns delay router delivery

also doesn't inspire too much confidence within the user community."

Moreover, the delay could damage European users' impressions, analysts said, as the 6611 was only introduced there in May.

"Many users were surprised when the 6611 wasn't announced here in January, so it's a little [disconcerting] to see it delayed already," said Mark Lillycrop, an analyst with the Xephon consultancy in Berkshire, England.

According to Janet Hyland, director of network strategy research at Forrester Research, Inc., a Cambridge, Mass.-based consultancy, the delay may reinforce the mind-set among some large users that IBM is floundering in the internetworking arena. But she expects others will simply wait.

"There is a large portion of Fortune 1,000 companies that are not using a LAN internet and will wait for IBM until IBM's ready," she said. "Also, IBM is right not to force customers to work out bugs in the 6611 by releasing it too soon." ⚡

You can't get there from here

are lacking even the basics today.

"What is a NOS today, anyway? It's file service," said Jamie Lewis, vice-president of information services and a principal analyst for The Burton Group, a Salt Lake City consulting firm specializing in the LAN industry. "For the vast majority of people, if they could get file service to interoperate at an acceptable level, that would be all they need."

Although some vendors offer limited access between network operating systems through multiple client-based redirectors or gateways, these solutions present an array of problems for administrators and do not provide ample interoperability for users. Rather, they represent a calculated balancing act between serving the interests of buyers and maintaining a competitive edge.

"Vendors are using guerilla warfare — attacking the symptoms, not the problem," said Todd Dagres, an analyst at The Yankee Group, based in Boston. He claimed vendors are providing some of the access users are asking for but are making sure their operating systems are the basis for that access.

"They should be cooperating to find common specifications" for services such as file, print, directory, security and messaging, Dagres said.

Push and pull

Others agreed. "Vendors understand that the nature of the LAN business will eventually force them to cooperate with one another," said Nancy McSharry, a Mountain View, Calif.-based analyst with International Data Corp (IDC). "[But] it's the old push and pull. How far do you go in cooperating before you give away the competitive edge?"

With the solutions vendors offer today, the burden of accessing services on other network operating systems falls mostly on the client. For example, if a Novell NetWare user wanted to access a file from a Microsoft LAN Manager network, the user would have to have a copy of the LAN Manager redirector.

The four main network operating system vendors offer this multiple-redirector capability, and it does provide a basic level of interoperability. But it is not an optimal solution because the user is still physically accessing services from at least two different environments, making the connection hardly seamless.

For example, users must log out of NetWare and into LAN Manager. Once logged into LAN Manager, the file, print, directory, management and security ser-

vices — as well as many other aspects — are different.

"Today, you load the redirector software from both vendors on every client so clients can see both servers," Burton said. "But the way they view [and use] servers and services in those environments is different."

Lewis agreed. "Client-based interoperability of that type is acceptable only as a short-term solution," he said. "It puts the burden on the user who has to learn three or four environments."

It's no easier on net managers.

"Your [network] administration is suddenly multiplied by the number of clients instead of servers," Lewis said.

Gateway solutions from vendors and third parties alike are no better, users and analysts said.

Banyan, for example, offers a gateway between VINES file services and NetWare. Third-party vendor Trellis offers a product that allows Banyan users to access a Novell server's files through one client.

In one sense, gateways solve many complaints associated with multiple redirectors. However, they do not offer users the full services they can get by logging into a foreign server, such as applications or directory service. In addition, they require too much upkeep and resources.

"I could do a bridge that may require 50,000 components to get from here to there, but that's just not practical," said Luther Gibson, systems analyst for the National Forest Council, a Washington, D.C.-based lobbying and education group for the logging industry.

Perhaps Apple Computer, Inc. has been the most successful in integrating at least its file services with other vendors' network operating systems. Because it owns the Macintosh in both body and soul — hardware and software — it has persuaded every major LAN vendor to support its native AppleTalk Filing Protocol (AFP) at the server — or simply forgo Macintosh clients for its networks.

As a result, Macintosh workstations today can access all three major LAN environments in the same manner as they access a native AppleShare server.

Printing is another matter,

however. While users can find some way by hook or by crook to share files, sharing printers is the impossible dream, especially for Macintosh users.

"A [LAN Manager] client can go across the corporate net to access the file services [of another network operating system], but there are problems when you want to share a common printer," said Paul Bandrowski, technology manager at Sara Lee Corp., based in Chicago.

All the major network operating systems and the Macintosh

Sharing printers is the impossible dream, especially for Macintosh users.

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use incompatible print protocols and spooling techniques, a fact that isn't lost on third parties that are making a fortune selling hardware and software that patch two or more net operating systems into a single printer, plotter or other output device.

In fact, users pay extra for most file and print interoperability products.

"I don't like purchasing another product to resolve a problem that should be resolved from within [the network operating system]," said the National Forest Council's Gibson. "As we continue to grow, add-ons have become a major portion of my budget; it just can't continue that way."

Long-term grand plans

Vendors acknowledge that there are problems they have yet to solve.

"Most people want a single login and single administration into multiple server, multiple vendor environments," said Doug Knight, a spokesman from Novell, who spoke at a panel discussion at the recent INTEROP 92 Spring show in Washington, D.C.

To this end, vendors have proposed several grand unification schemes for basic network services: file, print, directory, messaging and security.

Novell's strategy is, perhaps, the most widely publicized to date. The company plans to offer its own distributed directory services and openly invites others to develop NetWare Loadable Module (NLM)-versions of its directories and other services.

Banyan recently announced its Intelligent Messaging service and said it will take the messaging service and its directory, security

and other services to other network operating systems.

Microsoft is counting on a plan called Windows Open Services Architecture (WOSA) to do the trick. WOSA provides a single set of application program interfaces (API) that lets the user access services from other environments that also employ WOSA's interface.

Apple is building a similar solution called the Open Collaboration Environment. This framework of directory, security and messaging services for the Macintosh also offers a back-end API, called a Service Providers Interface (SPI), allowing users to replace Apple's services with those of another company, as long as they comply to Apple's SPI.

Naturally, each scheme is based on that vendors' products. For example, Novell's NLM strategy is centered around NetWare servers. In all environments, it will be up to third parties, not the net operating system vendor, to build products that provide the connectivity. Many schemes are also years from performing as well in the real world as they do on paper.

Service specifics

In addition to these grand schemes, almost all the vendors have mapped out specific strategies to deal with certain interoperability concerns.

The NetWare 4.0 net operating system, expected by the end of this year, will use X.500 as the model for its directory service.

"We hope to interoperate through X.500. All our [NetWare 4.0 directory service] schemas will be based on the X.500 recommendations," Knight said.

The other vendors pledged to support the X.500-based directory service of the Open Software Foundation's Distributed Computing Environment (DCE).

"In the long term, we intend to include the DCE directory [within LAN Server]," said Art Olbert, personal systems director of LAN systems at IBM's Personal Systems division in Somers, N.Y.

"[This will] allow any client to access an entire set of resources by a single name."

Barry Burke, director of strategic product planning at Banyan, agreed. "Banyan is behind the DCE interoperability approach for a heterogeneous directory management interface," he said.

Dwayne Walker, director of Windows NT and networking products at Microsoft, said his company would also support DCE, but he did not specify if the support would be native or through WOSA.

But even support for standards will not guarantee interoperability. "There's a big myth about OSI — that it will come along and solve everything. It won't happen that way," The Burton Group's Lewis said ("Is OSI dead?," *NW*, June 15).

For example, a recent Burton Group report points out that for directories to interoperate, they must understand how to access and add information from one another's databases. The X.500 standard does not specify any of these details.

"DCE, DME and OSI are all too little, too late," The Yankee Group's Dagres said.

For this reason, Lewis thinks the real hope for long-term integration will come from architectures such as WOSA, OCE, Integrated Messaging or the Federated Services architecture recently announced by Sun Microsystems, Inc. "They are going to break the logjam of development," Lewis said.

Developing cross-LAN applications, such as Lotus Development Corp.'s Notes, requires vendors and users to put too much effort into supporting a slew of diverse environments or to just roll their own network services, he said. "Notes has its own [remote procedure call], file server, messaging and other services that the LAN should provide," he added.

But where Lewis points to Notes as an example of what's going wrong with integration, Mike

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Bailey, cites Notes as a prime example of what is going right.

Bailey, systems analyst for Lockheed Missiles and Space Company, Inc. in Sunnyvale, Calif., is among the skeptical users who say they cannot wait for the fruition of vendors' grandiose schemes but are looking to applications to mediate differences between platforms.

"I don't see Novell, Banyan and all those people ever changing their NOSes so they are compatible with everyone else's," said Bailey. "Eventually, the true interoperability standard will be set by applications."

He added that realizing the promise of these architectures will require extensive cooperation among vendors that cannot get along well enough to fulfill agreements many of them have already made to support one another's file service protocols.

The agreements Microsoft has struck with IBM and Banyan to merge protocols are as yet unfulfilled. The companies use different flavors of the Server Message Block (SMB) protocol running on a variety of Network Basic I/O System implementations.

IDC's McSharry does not think application vendors should have to deal with the underlying complexities of a myriad of network operating systems, but adds, "The vendor who does will make a lot of money.

"Too many people in this business lose sight of the fact that networks are there because people want to run applications on them. As far as users are concerned, they just want to run their apps on the network and they don't care how they do it."

Near-term solutions

Vendors are, however, taking steps that should beef up interoperability in the near term by supporting one another's network protocols at the server. Although some users are not sure they believe the promises, analysts said the timing is right for vendors to fulfill them in earnest.

"Novell owns file service," Lewis said. "If you want to compete, you have to deal with Novell."

Virtually all vendors have said they will license filing service protocols from their competitors and include those native protocols in server software. This approach would be identical to the support all vendors currently offer Macintosh users through AFP.

"The first fruits you'll see . . . from Novell is through our relationship with IBM," Knight said.

IBM is currently developing an SMB NLM, Knight said, so customers will have a single-system approach when accessing NetWare services from an IBM LAN Server environment. IBM, however,

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must support Novell's NetWare Core Protocols (NCP) on its LAN Server to offer NetWare users similar privileges, which Olbert said the company plans to do.

Microsoft also plans to add native NCP support to LAN Manager, according to Walker.

"Today, we support [LAN Manager] SMB and [Apple's] AFP on servers," he said. "But you can expect in '92 and the first half of '93, we will add support for NCP, as well as a few other protocols, both in the Unix world and others."

Walker added that the company's emerging Windows NT will include as many as six major file service protocols as a standard feature. NT is Microsoft's Unix-like 32-bit operating system that integrates features of LAN Man-

"**Y**ou'll notice Novell is saying very little [about interoperability]," McSharry said.

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ager and can be used as either a server or a high-powered desktop operating system.

Banyan also pledged to offer native support for other protocols within the server, although company officials stopped short of providing specifics, such as whether their company had licensed NCP.

Even with Macintosh's phenomenal success in file service integration, Apple is making plans to support Novell's Internetwork Packet Exchange (IPX) network protocol on the Macintosh. It is not clear, however, who will take responsibility for providing NCP support on the Macintosh. But support for IPX is enough to pave the way for creating enterprise applications based on NetWare, according to Steve Nelson, director of marketing for Novell's Walnut Creek, Calif.-based Macintosh group.

In the area of printing, IBM has the clearest plan for actual interoperability.

"In the long term, our investment is focused on the Paladium technology," IBM's Olbert said. Paladium is a printer-specific

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protocol that defines how servers talk to printers. IBM hopes other vendors will adopt the protocol, which could ultimately allow any server to use any printer.

Slow, but moving

Users and analysts agreed that although these beginnings of change are, indeed, only the beginning, they mark a change in vendor attitudes. "No less than a year ago, the [vendor] response to some of these questions would have been, 'That's their problem,' " Burton said.

"Vendors realize they can no longer ignore the presence of other products in their customers' environments," said Elaine Bond, senior vice-president at The Chase Manhattan Bank, N.A. in New York and head of the recently formed Open User Recommended System user advocacy group.

But lip service and changes in attitude do not solve the problems users face now. With the competition for LAN users' dollars moving on to higher services, such as messaging or directories, vendors have little reason to not support at least one another's file and print services.

As the industry leader, Novell has taken a brave first step in licensing its NCP to competitors, while its rivals have shown even more chutzpah in planning to support the protocol. Now it's time for Novell to live up to the "responsible leadership role" company officials so often espouse. The company should support not only IBM's flavor of SMB at the server, but also Banyan's and Microsoft's — and soon.

Unfortunately, analysts said they hold little hope of this ever happening. "You'll notice that Novell is saying very little [about interoperability]," said IDC's McSharry. "Since they own 60% to 65% of the market, they don't have to cooperate. But other players are going to have to play with Novell."

For its part, Novell said it is willing to work with any company that approaches it about interoperability. "That sort of work is a two-way street," said Bob Young, director of marketing for the NetWare Products Division. "We would be willing to support them in that effort." Young stopped short of saying whether Novell would offer support for Microsoft's SMB in exchange for support of NCP. "Microsoft as yet has not licensed NCP," he said.

Novell is not being stubborn, just pragmatic, Young said. "Any time you are embarking on a development project, you look at the potential return on investment. In this case, the [other party] would benefit the most. This needs to be a two-way thing." ▨

Bytex to roll out routing modules

cards that reside in an intelligent hub and route traffic between two hub-attached LANs or from one LAN onto a WAN, said Janet Hyland, director of network strategy research at Forrester Research Inc., a Cambridge, Mass., consultancy.

"Today's hub-based routers are low-end devices with a limited number of port connections so users who need better performance must look to a stand-alone router. With the Bytex router, they can now get that high-performance routing right inside the

"**U**sers who need better performance must look to a stand-alone router."

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hub," Hyland said. Although Bytex is the first, she expects a number of vendors will roll out so-called second-generation internetworking hub modules over the next year.

Bytex's new routing modules will plug into one of four optional card slots in the 17-slot 7700 hub chassis and provide access to the device's 3G bit/sec matrix switch-based backplane. They will be able to dynamically establish links across the backplane at full LAN speeds, offering support for such high-bandwidth applications as imaging.

That also enables the modules to support per-port routing, meaning data coming into one bridge/router port is sent out of its destination port without traversing intermediate networks. This contrasts with typical hub-based routing that — because of its two-LAN limitation — often requires multiple hops.

The modules will support the same popular LAN protocols as Wellfleet's and CrossComm's existing bridge/routers, as well as transparent bridging and the source routing and source routing transparent bridging algorithms.

Bytex said the router will be available by year end. Pricing details were not available.

Bytex also announced plans to support FDDI LANs by year end. The company will first provide a stand-alone FDDI Work Group Concentrator that supports fiber- and copper-based FDDI links to the desktop and, by the first half of 1993, an FDDI router module for the 7700 hub that will give to-

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ken-ring and Ethernet LANs access to an FDDI backbone.

On the net management front, the Series 7700 NMS Release 2.0 software includes four new management capabilites to enhance the management and security of the 7700 hub. One detects token-ring beaconing conditions, another helps isolate faults, and a third monitors stations connected to the LAN and notifies a net administrator of unauthorized additions or moves.

To enable net administrators to manage the net from a central IBM host management station, Series 7700 NMS is also equipped with software that enables it to send alert data to and receive commands from NetView.

All four features are available now as a free software upgrade.

Bytex also said it will roll out within 90 days Simple Network Management Protocol support on its token-ring modules.

Finally, the company said it will support by next year the Open Software Foundation, Inc.'s Distributed Management Environment by migrating its net management applications to Hewlett-Packard Co.'s OpenView net management platform. ▨

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